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FINAL
ORGANIC DESIGN PLAN

HOWE VALLEY LANDFILL
HARDIN COUNTY, KENTUCKY

Prepared by:

HATCHER-SAYRE, INC.
Lexington, Kentucky
January 22, 1993

Job No. 0064-001

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1.0 INTRODUCTION

The purpose of the Organic Design Plan is to design the selected remedy for the organic contaminants to ensure protection of human health and the environment. The Organic Remedial Action is the implementation phase of site cleanup or actual construction of the remedy for organic material, including necessary operation and maintenance, and monitoring. The Organic Remedial Action is based on the Organic Design Plan in order to achieve the cleanup results specified in the Record of Decision (ROD). This Organic Design Plan, in conjunction with the subsequent Field Sampling and Analysis Plan (FSAP), Health and Safety Plan (HASP) and Technical Specifications, will provide the procedures for implementing the Organic Design Plan activities at the Site.

The Site objectives for the Howe Valley Landfill have been established as follows:

1. Review of existing information pertaining to the Site. This includes the ROD, the Remedial Investigation/Feasibility Study (RI/FS), and other reports or related information.

2. Review of relevant Remedial Design/Remedial Action (RD/RA) guidance which will be used in performing the RD/RA activities and preparing all deliverables.

3. Collection of additional data, as necessary. This may include additional sampling, geotechnical investigations, surveys, etc.

4. Performance of a Bench-Scale Treatability Study to evaluate and properly design the selected remedy.

5. Preparation of detailed design plans and specifications necessary to implement the selected remedy.

6. Actual implementation of the selected remedy, including construction activities necessary for its implementation.

7. Monitoring of the selected remedy to ensure all cleanup goals are met. These cleanup goals, as specified in the ROD, are as follows:

Compound	Soil Action Level
Chromium VI	400 mg/kg
Copper	2,300 mg/kg
Zinc	16,000 mg/kg
Cyanide	1,600 mg/kg
1,1,1-trichloroethane	117.30 mg/kg
1,2-dichloroethene	7.72 mg/kg
Tetrachloroethene	>7.50 mg/kg

These cleanup levels were set to ensure that contamination in the groundwater at the Site would be below MCLs or health-based levels. The risk associated with ingestion of soil from the Site will be reduced to 1×10^{-6}. The reduction to this risk level will also protect groundwater.

8. Ensuring that all federal and state applicable or relevant and appropriate requirements (ARARs) are met. These ARARs, as specified in the ROD, are as follows:

Federal

* Resource Conservation and Recovery Act Hazardous Waste Requirements
  - Treatment, Storage and Disposal Regs. (40 CFR 264 and 265)
  - Land Disposal Regs. (40 CFR 268)

* Clean Water Act - PL 92-500
  - NPDES (40 CFR 122 through 129)
  - Water Quality Criteria [Section 304(a)(1)]

* Safe Drinking Water Act
  - MCLs and MCLGs (40 CFR 141 through 143)

* Clean Air Act
  - NAAQS (40 CFR 50 and 51)
  - PSD (40 CFR 52)

* OSHA Requirements
  - Workers (29 CFR 1910 and 1926)
  - Air Contaminants: 8-hour Time Weighted Averages (TWAs) (29 CFR 50)

* Department of Transportation Regulations
  - Transportation (40 CFR 171 through 177)

* EPA's Groundwater Protection Strategy

State

* Solid/Hazardous Waste Requirements Reporting and Standards (401 KAR 32, 34 and 35)

* Air Quality
  - Fugitive Emissions/Open Burning (401 KAR 63)
  - Ambient Air Quality Standards (401 KAR 53)
  - Toxic Emissions (401 KAR 63)

* Water
  - Discharge of Waste (401 KAR 5)
  - Surface Water Standards (401 KAR 5)

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* Occupational Safety and Health
  - Workers (803 KAR 2)

* Transportation
  - Permits/Handling Procedures (601 KAR 1)

9. Implementation of all institutional controls necessary for completion of the final remedy, including but not limited to deed restrictions.

2.0 SITE BACKGROUND INFORMATION

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The following Howe Valley Site background information was compiled from data gathered from the RI/FS, RD, ROD, records and reports of previous investigations conducted by the Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC), U.S. Environmental Protection Agency (USEPA) and its contractors, existing literature sources, Dow Corning Corporation and Eagle-Picher Industries, Inc.

2.1 SITE DESCRIPTION

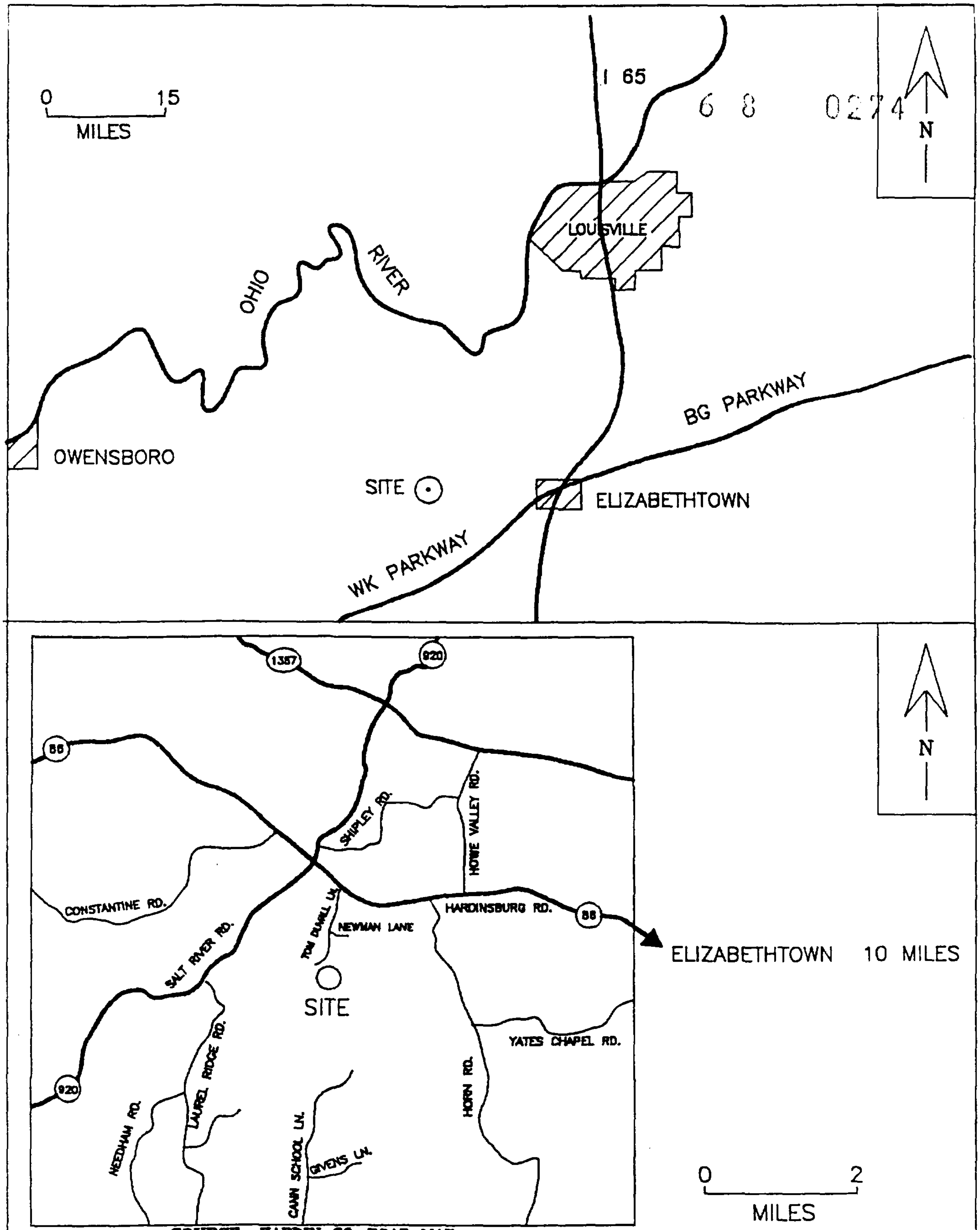
The Howe Valley Landfill Site is located in Hardin County, south of Vertrees, Kentucky. It lies 1.4 miles south of State Road 86 at the end of Tom Duvall Lane (Figure 1). The Site is positioned at the boundary of the Constantine and Howe Valley USGS quadrangle maps at coordinates of 37°40'05" N latitude and 86°07'30" W longitude. It consists of approximately 11 acres of sparsely vegetated land situated in a topographic basin. Approximately 2.5 acres of this site had been cleared for the landfilling of wastes.

2.1.1 Physiographic Description

The topography of the Site is characterized by gently to moderately rolling uplands (rough in places) with lower-lying karst plains. The areas north and northeast of the Site are karst plains, characterized by features such as sinkholes, sinking streams, springs and solution features. Elevations of these plains range between 640 and 730 feet above sea level. The topography throughout the rest of the Site is characterized by relatively steep-sided ridges and valleys with elevations ranging from about 600 to 900 feet above sea level.

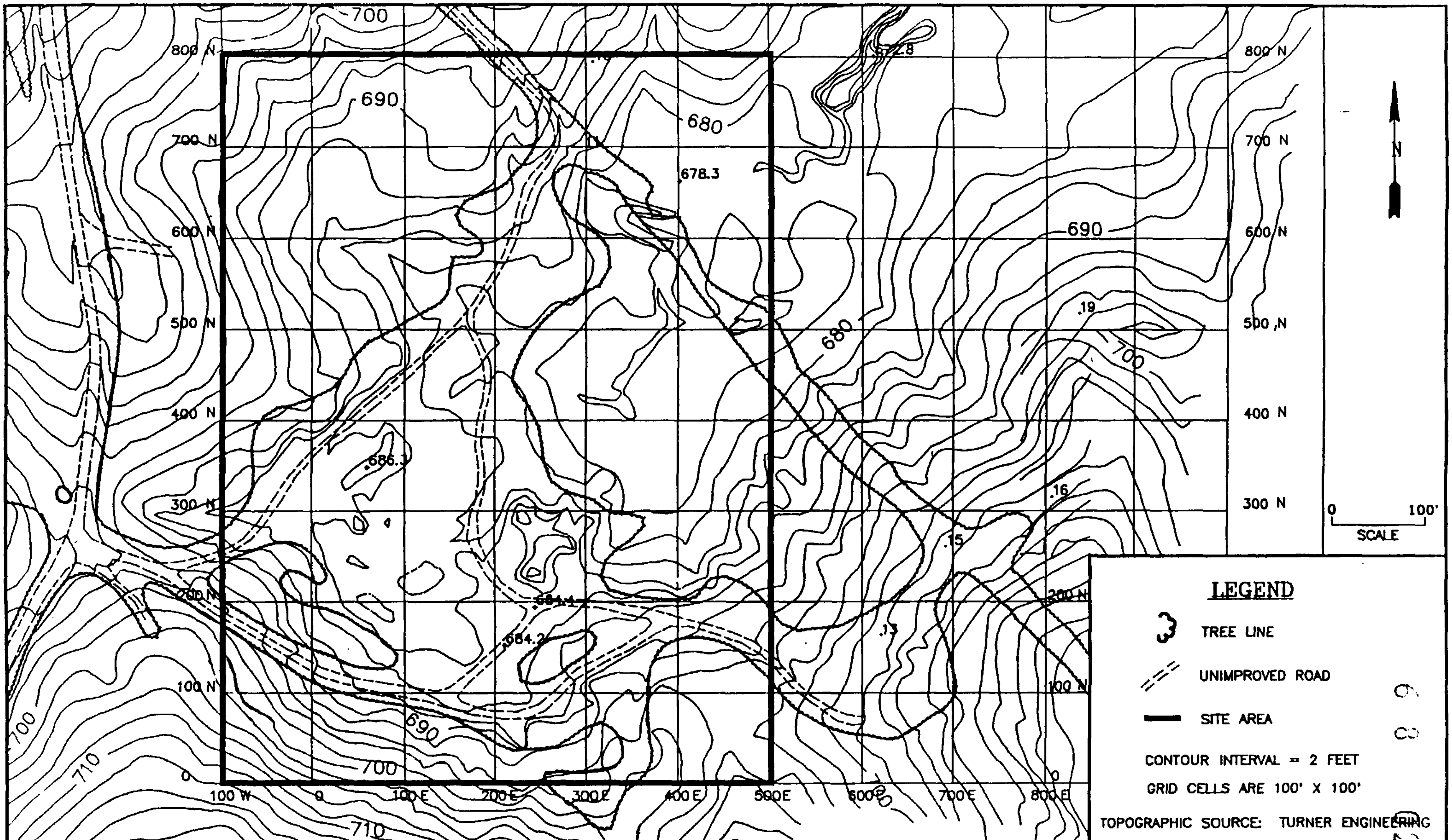
The Site is located in the southwestern portion of the karst plain described above with an average elevation of about 680 feet above sea level (Figure 2). Cow Cliff forms a topographic ridge on the east and south borders of the Site. The Site is located in an approximate 450-acre topographic basin devoid of perennial surface streams. Drainage is to the sinkhole located on the Site.

The on-site sinkhole is a large depression, approximately 150 feet long and 30 feet wide with the longer dimension trending NE-SW. Several swallets have developed within this sinkhole, ranging from 10 to 15 feet in diameter and 5 to 10 feet in depth. Two other well-developed sinkholes are located adjacent to and immediately southeast of the Site while a third is a few hundred feet to the southwest. The Site is located within a closed basin and, therefore, no off-site sinkholes receive surface runoff from the Site.



SOURCE: HARDIN CO. ROAD MAP

DATE: 7/2/91	**FIGURE 1** LOCATION OF HOWE VALLEY LANDFILL	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH		
APPROVED BY: TY		CLIENT NO.: 0064-001



DATE: 7/8/91	**FIGURE 2**	HATCHER-SAYRE, INC.
DRAWN BY: PDH	TOPOGRAPHY: HOWE VALLEY LANDFILL (MAY 1988)	LEXINGTON, KENTUCKY
APPROVED BY: TY		CLIENT NO.: 0064-001

1117SITE

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2.1.2 Hydrologic Description

As indicated earlier, a sinkhole plain has developed north and northeast of the Site on the underlying limestone. Surface drainage in this area is intermittent and drainage ditches are usually truncated by sinkholes. The Site itself is located in a closed, 450-acre, hydrologic basin which drains to the on-site sinkhole. West and southwest of the Site, surface drainage becomes more dense; dendritic stream patterns are present in the areas adjacent to the sandstone-capped ridges. Linders Creek represents the primary local surface water body toward which the surface water entering the Site sinkhole moves. The surface water is eventually discharged after emerging from Boutwell Spring. Linders Creek flows into the Rough River, which in turn flows into the Green River and, eventually, into the Ohio River near Henderson, Kentucky.

2.1.3 Geologic Description

The underlying strata of the Howe Valley Site are part of a large belt of alternating beds of sandstone, shale and soluble carbonates. These beds extend northward into Indiana, west to Missouri and south to Tennessee in what is physiographically termed the Mississippian Plateau. The Howe Valley Site is situated upon the Paoli Limestone, a light gray, ledge-forming limestone which is about 50 feet thick. Underlying the Paoli is the yellowish gray to light gray Ste. Genevieve Limestone. Both limestones serve as aquifers, with more than three-fourths of the drilled wells rated as adequate for domestic supply water (Brown and Lambert 1963).

The formations overlying the Paoli Limestone in the surrounding ridges are listed below along with their approximate thicknesses. No private well logs were available for this particular area and, therefore, the geologic data are based upon previously published USGS data. The generalized geologic column for this area is presented on Figure 3.

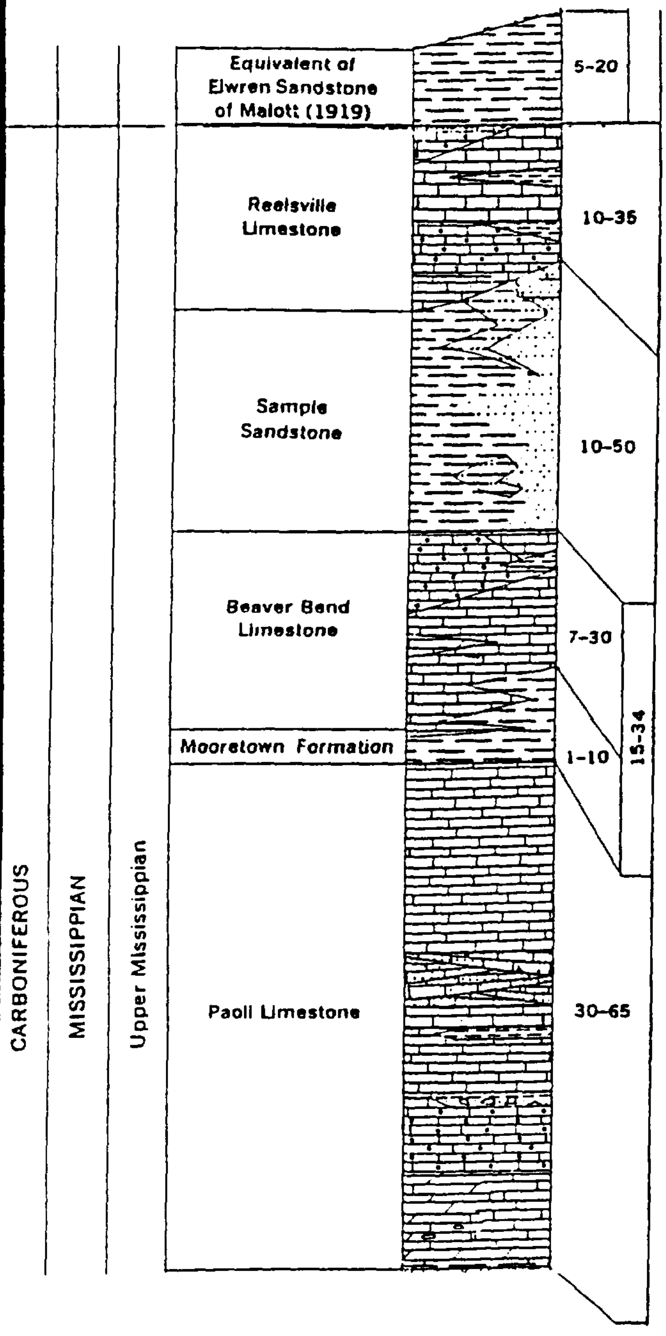
Hardinsburg Sandstone (5+ feet)
Haney Limestone Member (15 feet)
Big Clifty Sandstone Member (100 feet)
Beech Creek Limestone Member (15 feet)
Reelsville Limestone (20 feet)
Sample Sandstone (30 feet)
Beaver Bend Limestone and Mooretown Formation (30 feet)
Paoli Limestone (50 feet)
Ste. Genevieve (170 feet)

Strata dip to the southwest at approximately 1 foot per 100 feet. Considerable faulting has occurred west of the Site. The two major faults in that area are the Pole Bridge Fault and the Mount Olive Fault. Both are thought to be inactive and are located about 2 miles west of the Site. The fault lines are in a northeast-

SYSTEM	SERIES	FORMATION AND MEMBER	LITHOLOGY	THICKNESS IN FEET	DESCRIPTION
QUATERNARY		Alluvium		0-10	Sand, poorly sorted, clayey and silty; locally gravelly; contains pebbles and cobbles of limestone, sandstone concretions, and chert; locally clayey and silty sand in large shallow sinks. Loess-derived soil as much as 2 feet thick covers some of the area.
		Hardinsburg Sandstone		30+	Sandstone, yellowish-gray, limonite-stained, fine-grained, thin-bedded, flaggy to massive; conformable with underlying limestone.
		Golconda Formation: Haney Limestone Member		15-27	Limestone, bluish-gray, finely to coarsely crystalline, detrital, thin- to thick-bedded, fossiliferous; silicified limestone abundant in middle of unit; commonly reduced by leaching during weathering to about 5 feet of red clay residuum containing abundant grayish-yellow to white porcellaneous chert blocks that contain casts of crinoids and *Archimedes* sp. Basal contact generally concealed; locally marked by seeps and springs.
		Golconda Formation: Big Clifty Sandstone Member		65-120	*Sandstone and shale*: Sandstone is grayish yellow to yellowish brown, locally pale red, fine to medium grained, moderately well cemented, quartzose, ripple marked, crossbedded, massive; forms cliffs 40 to 60 feet high. Shaly sandstone or silty shale in uppermost 20 to 30 feet weathers to scalloped surface on more resistant sandstone cliffs and obscures upper contact. Clay-shale is grayish green to olive gray and nearly everywhere makes up lowest 5 to 15 feet of member. Fossils include a few coalified fragments or limonite-cemented casts of woody plants and rare casts of poorly preserved brachiopods. Limonitic boxworks and nodular concretions are common. Basal contact generally obscured by sandstone rubble.
		Golconda Formation: Beech Creek Limestone Member		5-14; 12-28	Limestone, yellowish-gray to pale-yellowish-brown, coarsely to finely crystalline, clastic; even beds 3 inches to 3 feet thick. Fossil brachiopod *Productus inflatus* McChesney generally abundant within 2 feet of top and less common near base, distinguishes unit from lower limestones. Other productids, spirifers, *Composita* sp., *Pentremites* sp., *Archimedes* sp., and trilobites are also present. Unit is generally obscured by rubble or has been completely dissolved by ground water. Basal contact is abrupt where seen; commonly marked by springs and seeps.

FIGURE 3

GENERALIZED GEOLOGIC STRATIGRAPHIC COLUMN



Clay-shale, dark-greenish-gray, weathers to light greenish yellow. Forms gently sloping surface on bench on Reelsville Limestone. Basal contact is abrupt.

Limestone and shale: Limestone is yellowish gray, light gray to bluish gray, locally dark yellowish orange; finely to coarsely crystalline; commonly oölitic near top and base; in beds 4 inches to 3 feet thick. Two shale beds as much as 2½ feet thick are present in outcrop east of Summit fault; one may be fairly continuous. Sand-sized fragments of crinoids and shells weather out on surface; *Composita* sp., *Girtyella* sp., and *Pentremites* sp. are common, *Talarocrinus* sp. is rare, and plates of *Agassizocrinus* sp. are locally very abundant. Basal contact gradational; locally, alternating sandy limestone and limy sandstone make up lower 12 feet and basal oölite is absent. Springs and seeps mark basal contact locally.

Sandstone and shale: Sandstone is grayish yellow to yellowish brown, fine to medium grained, poorly to moderately well cemented, quartzose, crossbedded, ripple marked, shaly to medium bedded, locally massive; forms cliffs; limonite stained along joints and around weathered iron sulfide concretions; flattened, oval clay galls as much as an inch across are common along some bedding planes. Sandstone is interbedded with and laterally gradational into silt- and clay-shale within half a mile. Clay-shale is medium dark gray to greenish gray, generally interbedded with shaly or thin-bedded sandstone. Formation thins where shale content increases; shale makes up entire unit in easternmost exposures along south border of area. Basal contact is abrupt and generally marked by a line of shallow sinkholes which develop in underlying limestone.

Limestone, yellowish-gray to pale-yellowish-brown, coarsely to finely crystalline, oölitic; rarely dolomitic; contains disseminated pyrite; thin- to medium-bedded; weathers to flaggy ledges 3 to 5 feet thick; some beds composed almost entirely of fragmental shell and crinoid remains; white-weathering oölitic limestone generally constitutes upper 5 to 10 feet of unit. *Pentremites* sp. is common; *Talarocrinus* sp. and *Agassizocrinus* sp. are fairly common. Lower part grades into the Mooretown; unit thickens to south as Mooretown thins.

Shale, medium-dark-gray to greenish-gray, weathers to yellowish-gray; clayey; 1 to 3 fossiliferous calcareous layers less than 1 inch thick; carbonaceous streak locally in upper 2 to 3 feet; weathered slopes commonly littered with yellowish-orange, soft, irregular clayey nodules. Basal contact is abrupt and marked by bench on Paoli Limestone.

Limestone and shale: Limestone is light yellowish gray to brownish gray; weathers light gray to light bluish gray; dense, sublithographic to medium crystalline, oölitic, detrital, pyritic, and locally dolomitic; generally in beds 2 to 6 feet thick. Crossbedded detrital limestone made up of well-rounded shell fragments, oölites, and scattered quartz grains; forms persistent unit about 10 feet thick 20 to 30 feet below top; locally conglomeratic at base. Silty clay-shale is yellowish to brownish gray, weathers yellowish gray; in 1 to 3 beds generally less than a foot thick. Base of Paoli distinguished from underlying Ste. Genevieve Limestone only on basis of fossil crinoids and colonial corals. Lowermost beds containing *Talarocrinus* sp. and *Lithodrumus veryi* Greene assigned to Paoli, uppermost beds containing *Platycrinites* sp. and *Lithostrotion (Siphonodendron) genevievensis* Easton assigned to Ste. Genevieve. Contact is placed at base of thin calcareous shale overlying a limestone breccia bed. Although similar breccia beds are present—one about 20 feet above the contact, others in the Ste. Genevieve—this bed is the only one bracketed by index fossils and is probably equivalent to Bryantsville Breccia of Malott (1952). Secondary silica has everywhere replaced breccia to some extent, and chert remains as gray to pale-yellowish-brown blocks and slabs 1 to 8 inches thick on weathered, soil-covered slopes. In many places a dolomitic limestone bed 2 to 3 feet thick in the basal 20 feet of the Paoli contains quartz spherulites an inch in diameter and irregular quartz geodes as much as 6 inches in diameter.

FIGURE 3 CONTINUED

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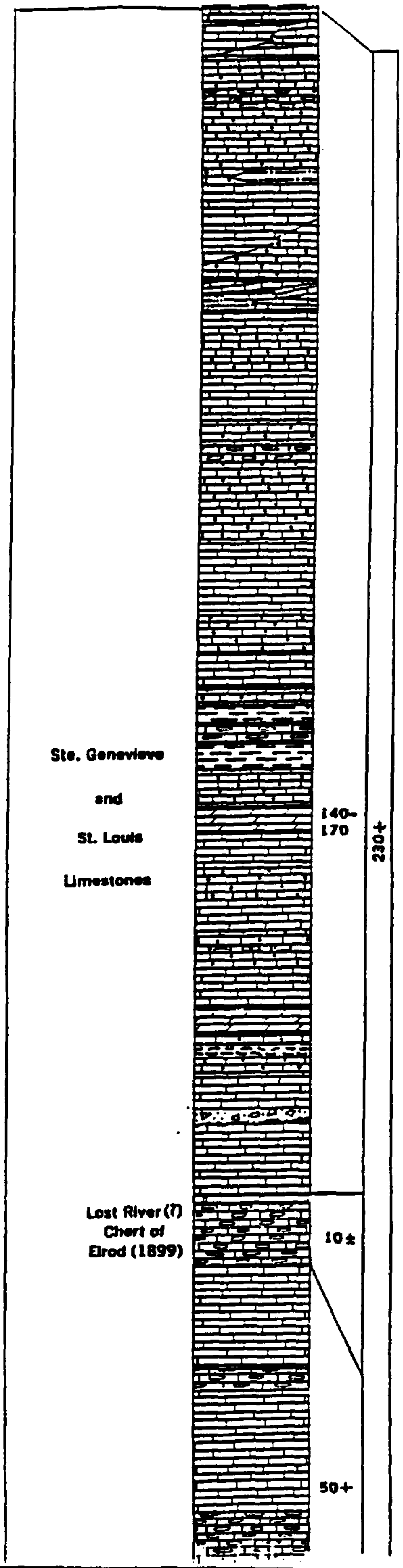


Limestone, dolomite, and shale: Limestone is yellowish gray, weathers white to light gray; characteristically oölitic, thick bedded, massive; interbedded with about equal amounts of sublithographic to medium-crystalline clastic limestone that is shaly, pyritic, weathers to smooth, rounded surfaces; 1 to 3 thin beds of limestone breccia or intraformational conglomerate fairly persistent near top, one near base of formation. At least two zones of very thinly crossbedded detrital limestone similar to unit in overlying Paoli indicate possible rhythmic deposition. Dolomite is yellowish gray, very finely crystalline, massive; locally calcareous and contains fist-sized vugs filled with crystalline calcite. Silty clay-shale is yellowish to greenish gray, locally calcareous. Fossils include horn corals, brachiopods, crinoids, gastropods, bryozoans, and trilobites. Persistent zone of echinoid spines and plates in oölitic limestone near base. Yellowish-gray to yellowish-brown, grayish-black to very dark red, vitreous to subvitreous, bedded, wavy-banded to nodular chert and silicified oölitic and fossiliferous limestone occur in several distinctive and persistent zones from top to near bottom of unit; chert weathers to white porcellaneous or chalky blocks; silicified oölitic limestone weathers to grayish-yellow to pale-yellowish-orange fragments of ellipsoids and individual fossils.

Soil, commonly as much as 30 feet thick, covers most of the unit. Loose, poorly indurated blocks of sandstone, mixed with silt, shale, limestone, and soil, appear to be derived from overlying formations by slumping into sinks formed during an earlier cycle of karst erosion. Except for those appearing in roadcuts, only the major sand areas are indicated.

Limestone, very pale orange to yellowish-gray, medium- to coarsely crystalline, clastic, contains very coarse fossil fragments; slightly oölitic; medium-bedded; about 20 feet thick; rarely exposed except in sinkholes; generally silicified about 10 feet below top in one or more beds 0.1 to 1.5 feet thick; resulting chert characterized by well-preserved casts of fenestellid bryozoans and several brachiopods, particularly *Orthotetes* sp., and is probably the Lost River Chert of Elrod (1899); top of the chert is the only mappable horizon in this part of section. Other workers have defined the contact between Ste. Genevieve and St. Louis Limestones as being some 20 to 40 feet beneath the Lost River Chert (Ray and others, 1946; Malott, 1952).

Limestone, yellowish-grey to olive-grey, medium- to finely crystalline, silty, thin- to thick-bedded, massive; contains several zones of gray chert, irregular and scattered to nodular along bedding planes. Weathers to mature karst topography; soil cover is generally 30 to 40 feet thick, reportedly as much as 100 feet thick. Base not exposed.

FIGURE 3 *CONTINUED*

southwest direction. Minor faulting has occurred to the north, northwest, southwest and south-southeast of the Site. The minor faults nearest the Site occurred approximately 1 mile to the west and an inferred fault occurred about 0.8 mile southwest of the Site. These fault lines also are in a northeast-southwest direction. These faults do not appear to have had any affect on the Site hydrogeology.

2.1.4 Soil Description

The soil type in the vicinity of the Site is the Caneyville-Hagerstown Association, which is comprised of moderately steep to gently sloping, well-drained soil and rock outcrops on hilly karst uplands (USDA 1979).

The Caneyville soil, which is found on hillsides, is well-drained and sloping to moderately steep. It has a loamy plow layer and a clayey subsoil that is underlain by limestone. The Hagerstown soil, found on ridges and side slopes, is deep, well-drained and gently sloping to moderately steep. It, too, has a loamy plow layer and a clayey subsoil.

2.1.5 Hydrogeologic Description

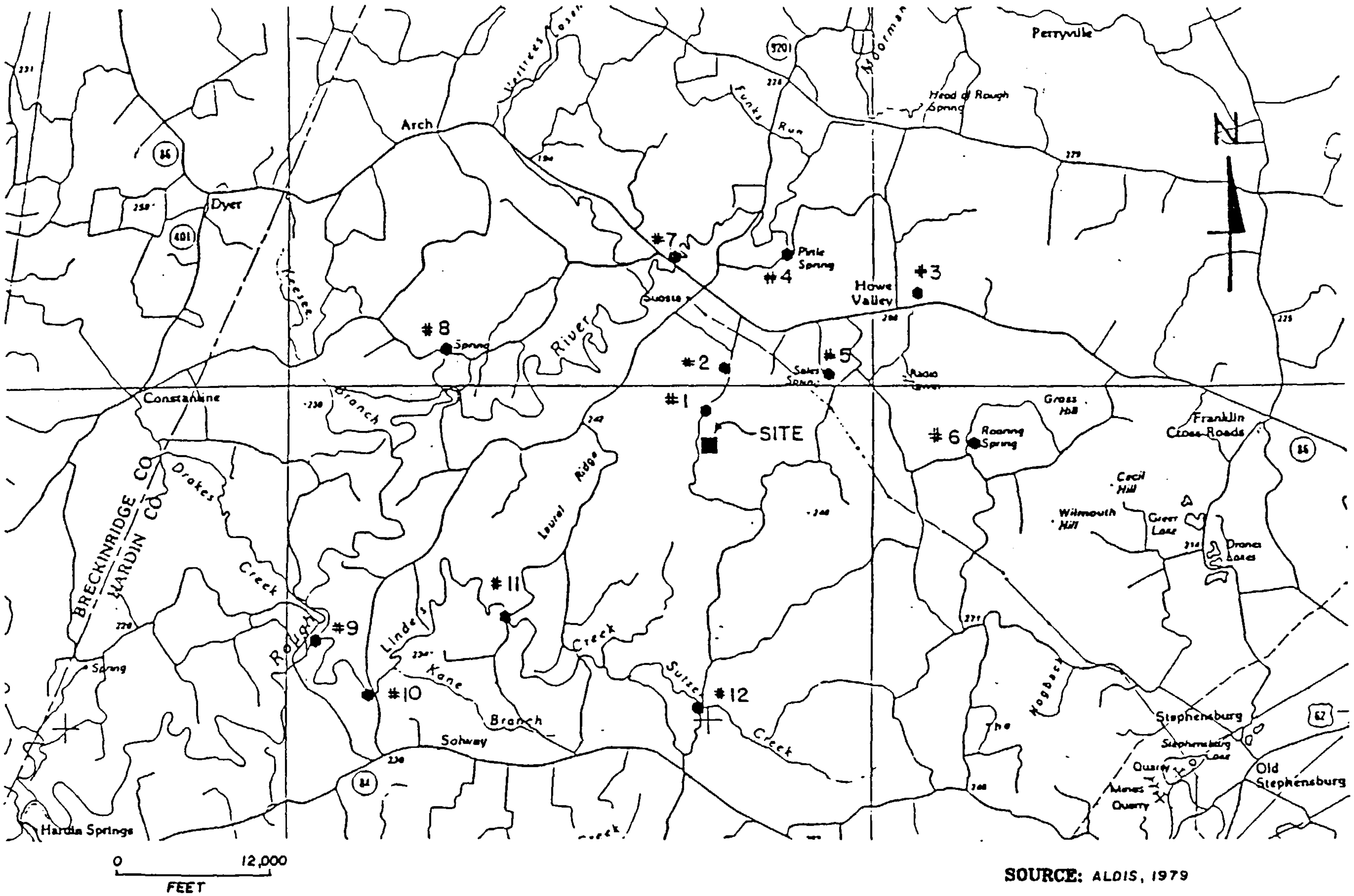
Surface runoff in the karst plain, which includes the Site, is intercepted by numerous sinkholes. Groundwater percolates through discontinuous joints, cavities and solution channels to some eventual groundwater base level. Groundwater below the Site eventually moves and discharges to Linders Creek. Although there is some evidence to suggest the presence of localized radial flow components within the region, this influence was not apparent from the flow system emanating from the Howe Valley Site. The nearest faulting in the Howe Valley area is approximately 1 mile from the Site and does not appear to have affected the Site hydrogeology nor does it appear to affect the water leaving the Site by way of the on-site sinkhole.

A dye trace study, conducted by the state of Kentucky in 1979, was performed to assess groundwater movement away from the Howe Valley Landfill. This brief memorandum report indicated that 5 pounds of a brilliant-flavine dye was introduced into the sinkhole on the eastern boundary and washed down with 1,500 gallons of water. Cotton collectors were used to assay the dye in water from wells, springs and creeks. Eight days later, 12 sample points scattered about the area were checked for fluorescence. Table 1 describes the checkpoints and Figure 4 shows their locations. Sample #11, located on Linders Creek to the southwest of the Site, was positive. Sample #10, which was downstream of Location 11, should have been positive, but the cotton receptor was not recovered. The other ten samples were negative (Aldis 1979). Considering the time and distances involved, the dye moved at

TABLE 1

LOCATION OF DYE TEST COLLECTORS (ALDIS 1979)

No.	Latitude & Longitude	Name	Type	Location
1.	37°40'26"N 86°07'22"W	Mrs. Goodman	Well Water	Faucet Samples
2.	37°40'45"N 86°07'12"W	Mr. Melvin Goodman	Well Water	Faucet Samples
3.	37°41'19"N 86°05'09"W	Howe Valley School	Well Water	150 Ft Deep
4.	37°41'46"N 86°06'31"W	Pirtle Spring	Spring	To Rough River
5.	37°40'39"N 86°06'04"W	Stiles Spring	Spring	In Sinkhole
6.	37°40'02"N 86°04'22"W	Roaring Spring	Spring	Where Spring Sinks
7.	37°41'40"N 86°07'49"W	Rough River	Creek	At 86 on Hwy Bridge
8.	37°40'33"N 86°10'20"W	Rough River	Creek	On West Bank
9.	37°38'15"N 86°12'06"W	Rough River	Creek	West Bank above Linders Junction
10.	37°37'47"N 86°11'20"W	Linders Creek	Creek	Linders Junction
11.	37°38'25"N 86°09'50"W	Linders Creek	Creek	Salt River Rd. Bridge
12.	37°37'37"N 86°07'34"W	Sutzer Creek	Creek	Bridge



SOURCE: ALDIS, 1979

DATE: 7/2/91	FIGURE 4	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	DYE TRACE DETECTOR LOCATIONS FOR KNREPC DYE TRACE STUDY, 1979	
APPROVED BY: TY		CLIENT NO.: 0064-001

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a rate of about 1,400 feet/day.

2.1.6 Demographic Description

The Site is located in census District 171 of the state of Kentucky (Figure 5). The total reported population in this district is 1,890 (from the Urban Studies Center of the University of Louisville 1980 census). Of this total population, 38% live on rural farms.

No known industrial facilities are located in District 171. The majority of land in the district is used for the cultivation of crops and the grazing of livestock and has a relatively low population density. Within the district, many residents depend upon wells, cisterns and springs for their domestic water supplies. A rural water distribution system provides water to residents north of State Road 86. The source of the water is the Hardin County pumping station located at Pirtle Spring.

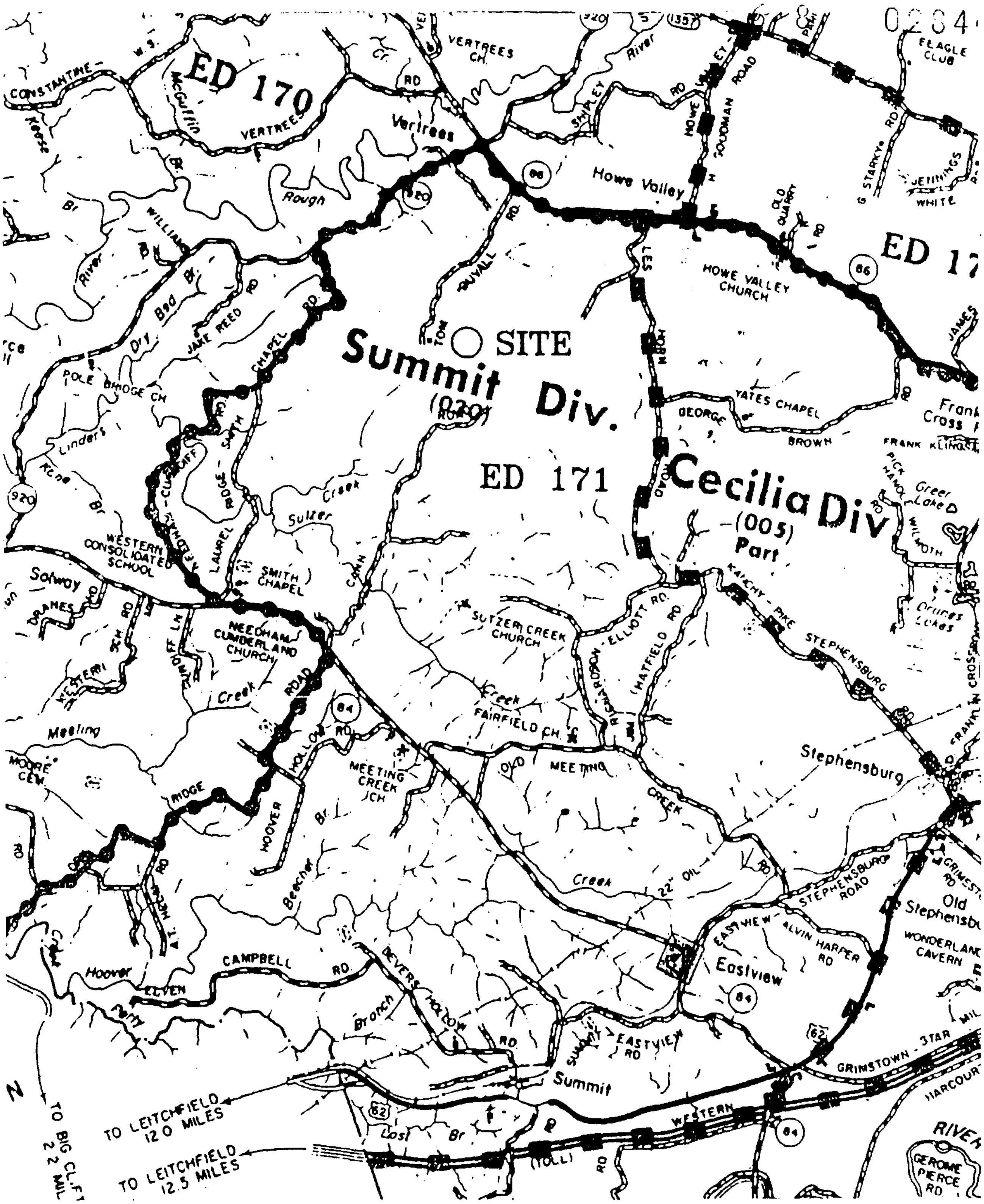
The Site is located in a sparsely populated area. There are 13 inhabited houses along the 1.4 mile length of Tom Duvall Lane. The nearest residence to the Site is located about 2,100 feet north of the Site at the terminus (as defined by County road maintenance) of Tom Duvall Lane. Two people reside in the house and it is estimated that about 50 others live on Tom Duvall Lane. The nearest residence to the Site not on Tom Duvall Lane is about 1 mile west of the Site.

2.1.7 Ecological Description

The habitat observed in the general vicinity of the Site consists of mixed hardwoods and pines. Major tree species include black oak, red oak, poplar, yellow pine and cedar. The Site, which had been cleared during disposal activities, is sparsely vegetated. The two major tree species which currently occupy the Site are second-growth cedar and an area of Scotch pine which had been planted by the landfill operator.

Fish and wildlife in the Howe Valley area that are known to the Kentucky Department of Fish and Wildlife Resources are listed on Table 2. This list is not definitive and includes only those species confirmed by the Department. Of the species reported, only the Henslows sparrow is listed by the Department as being of special concern. The gray myotis and Indiana myotis bats are both on the Kentucky and Federal Endangered Species Lists. The bats roost in trees or caves during the day and generally feed along streams and rivers at night.

No fish species occur on-site, however, frogs and snapping turtles were observed in the on-site ponds. Other wildlife species observed at the Site include box turtles, lizards, black and



SOURCE: CENTER FOR DEMOGRAPHIC AND POPULATION STUDIES UNIVERSITY OF LOUISVILLE

BOUNDARY MARKER

0 3500'

SCALE

DATE: 7/2/91	**FIGURE 5**	HATCHER–SAYRE, INC.
DRAWN BY: PDH	BOUNDARIES OF CENSUS DISTRICT 171 OF THE STATE OF KENTUCKY	LEXINGTON, KY
APPROVED BY: TY		CLIENT NO.: 0064–001

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TABLE 2

FISH & WILDLIFE KNOWN FROM HOWE VALLEY QUAD., HARDIN CO.

COMMON NAME	SCIENTIFIC NAME
Northern Fence Lizard	Sceloporus undulatus hyacinthinus
Five-Lined Skink	Eumeces faciatus
Worm Snake	Carphophis amoenus
Racer	Coluber constrictor
Black Rat Snake	Elaphe obsoleta obsoleta
Eastern Hognose Snake	Heterodon platyrhinos
Prairie Kingsnake	Lampropeltis calligaster calligaster
Northern Redbelly Snake	Storeria o. occipitomaculata
Virginia Opossum	Didelphis virginiana
Big Brown Bat	Eptesicus fuscus
Gray Myotis	Myotis grisescens
Indiana Myotis	Myotis sodalis
Eastern Cottontail	Sylvilagus floridanus
Southern Flying Squirrel	Glaucomys volans
Woodchuck	Marmota monax
Coyote	Canis latrans
White-Tailed Deer	Dama virginiana
Henslows Sparrow	Ammodramus henslowii
Bullfrog	Rana catesbeiana
Green Frog	Rana clamitans

Source: Kentucky Fish & Wildlife Resources copperhead snakes, deer, raccoons, opossum, rabbits, squirrels, field mice, vultures, crows, red-tail hawks, screech owls, rough grouse and several species of smaller birds.

2.2 SITE HISTORY

Kentucky Industrial Services, Inc. conducted industrial waste disposal operations at the Site, possibly as early as 1967. The Site was operated as an industrial waste landfill from 1967 to 1976 and was under permit by the state of Kentucky from 1970 to 1976. The Site has essentially been inactive since 1976, with access limited but not restricted. Types of wastes reportedly disposed at the Site consisted of manufacturing sludges, plating sludges, galvanizing wastes, silicone polymers, insulation and insulation by-products.

The Site was included on the Superfund National Priorities List (NPL) in accordance with Section 105(a)(8)(B) of CERCLA, 42 U.S.C. S9605(a)(8)(B). This Site was proposed as a Superfund Site on June 10, 1986, 51 Federal Register 21106 (1986) and finalized on the NPL on July 22, 1987, 52 Federal Register 27623 (1987).

During the first part of 1988, two Potentially Responsible Parties (PRPs), USEPA and KNREPC, agreed to conduct a RI/FS. The scope of the RI/FS included studies to characterize the type, magnitude and extent of contamination, as well as to characterize and excavate the buried waste at the Site.

2.2.1 Disposal Practices

The majority of the waste received by Kentucky Industrial Services was containerized. Overburden was removed by excavation; drums or containerized wastes were placed in the excavated area and then covered with excavated material. Most drums were buried in an upright orientation and placed next to one another. Near the center of the landfill, the overburden was slightly thicker. Kentucky Industrial Services excavated a trench and dumped containerized waste into it. The drums were then apparently sold or given away.

2.2.2 Previous Investigations

On May 8, 1979, a representative from the Kentucky Division of Water Quality collected water samples from a Site pond and from water wells of three landowners in the area (L. Moore, I. Goodman and M. Goodman). These samples were analyzed for four volatile organics thought to be related to the Site. Two of the well samples were positive, however, on May 23, 1979, the four sources were resampled by the same person and no volatile organic compounds were detected. A telephone report dated June 5, 1979 noted that the initial samples may have been taken improperly.

On June 27, 1979, representatives from the State and the USEPA collected water samples from the wells of L. Moore, I. Goodman, M. Goodman (private wells) and E. Goodman (Howe Valley School well). No metals of concern were detected in any of the samples. No volatile organic compounds were detected in the three private well samples. Chloromethane compounds detected in the Howe Valley School well were attributed to chlorination of the school's water.

A subsequent Site Investigation was conducted in November 1982 by USEPA contractors. Eleven samples were collected from the Site, consisting of three water samples and eight soil/sediment samples. The findings are summarized as:

- Inorganic analyses of the soil/sediment samples indicated the presence of 15 metals, of which eight (arsenic, beryllium, cadmium, chromium, mercury, nickel, lead and zinc) were listed as priority pollutants.

- Organic analyses of the soil/sediment samples detected four compounds, of which two [1,1-dichloroethane and bis (2-ethylhexyl) phthalate] were priority pollutants.

- Inorganic analyses of water samples showed the presence of seven metals, with zinc being the only priority pollutant.

- Organic analyses of water detected nine compounds, of which five were priority pollutants.

In October 1984, a geophysical investigation of the Site was conducted by an EPA contractor. The stated objectives of the survey were: (a) to establish the downgradient location of the solution channel and any smaller features, and (b) to investigate the areal extent of drum burial. In an attempt to locate the solution channel, an electromagnetic survey and a dipole resistivity survey were conducted. The electromagnetic survey was unsuccessful in locating evidence of solution features due to interference of the on-site landfill material and off-site topography. The resistivity survey did indicate an anomaly south-west of the Site. It was not, however, positively identified as a solution channel and apparently no additional attempt was made to further delineate or identify the anomaly. A magnetics survey was conducted to identify the drum burial areas. It was reported that the observed anomalies were likely related to buried drums, but that the number and depth of drums could not be established. It appeared that the drums occurred in localized pockets (NUS 1985).

In September 1987, an EPA contractor collected a subsurface soil sample from beneath a partially buried drum and a sediment sample from an on-site pond. Substances detected during analysis of the soil sample included cyanide and one organic compound. The sediment sample contained a trace amount of cyanide and three phthalate compounds. During this same time, samples were collected from Pirtle Spring, Howe Valley Elementary School and five private wells in the area. One well (Woodrow Stevens) initially tested high for lead and chromium, however, a subsequent sampling during December indicated that both of these metals were below detection limits.

2.3 DATA SUMMARY

Although the entire study area was approximately 11 acres, the actual area where historical disposal activities occurred was limited to just over 2 acres. This disposal area was subdivided into two removal/treatment areas: 1) the central area which is just less than 1 acre, and 2) the outlying areas which total a little more than 1 acre (Figure 6). These areas were separated primarily on the basis that the metal sludge waste drums were almost entirely buried in the outlying areas and, while the silicone wastes were found throughout the disposal area, the noncontainerized silicone waste was buried only in the central area of the Site.

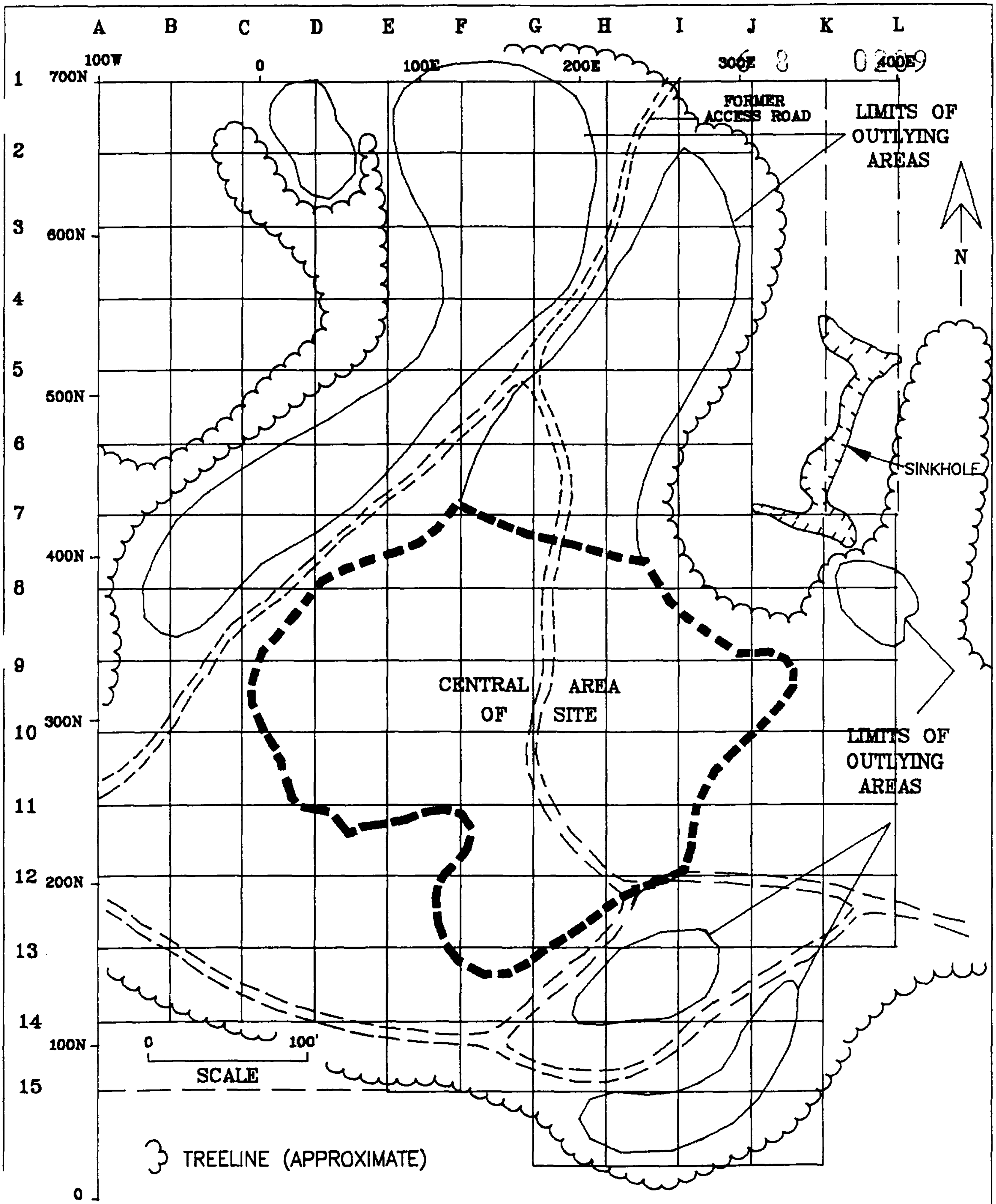
2.3.1 Initial Assessment

Based upon the results of the waste characterization and removal activities conducted at the Howe Valley Site, the following information was obtained:

- A limited number of industries disposed of waste at the Site.
- Four general waste types were encountered (silicone polymers, plating sludges, insulation manufacturing chemicals and rubbish).
- Noncontainerized surface wastes consisted primarily of insulation and rubbish.
- Ninety-nine percent (99%) of the drummed wastes consisted of silicone polymers (90%) and metal sludges (9%).
- Essentially one hundred percent (100%) of the noncontainerized, buried industrial wastes consisted of silicone polymers (caulking compounds).

The waste sources and environmental media were analyzed for the target compound list (TCL). As a result, four volatile organic compounds (VOCs) and two inorganic compounds were selected as the primary contaminants of interest. The four organic contaminants of interest [1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), 1,1-dichloroethane (1,1-DCA) and 1,2-dichloroethene (1,2-DCE)] were established based upon the following factors:

- They were all common to the major organic waste source.



DATE: 7/3/91	**FIGURE 6**	HATCHER–SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	CENTRAL AND OUTLYING AREAS OF THE SITE	
APPROVED BY: JDK		CLIENT NO.: 0064-001

0064–1

- They were the primary organic chemicals found in the environmental soil samples.
- They represented the most toxic of the Site VOC compounds.
- They are representative of the VOC compounds' solubility.

Three inorganic contaminants were originally reviewed as contaminants of interest: chromium, copper and zinc. Chromium and zinc were selected as the primary inorganic contaminants of interest since they represented the major source of inorganic contaminants buried in drums at the Site, i.e., the blue-gray plating sludge. Although copper was high in the other inorganic waste found at the Site, its disposal had been limited to a single area having a total of only 31 plastic drums. Therefore, while copper was significant in this one localized area, it was not considered a contaminant of interest for the entire site.

The only on-site environmental medium identified as being contaminated following removal activities was the on-site soil. Two on-site soil locations were identified as containing elevated concentrations of chromium. One location (where heavy metal sludge was composited) already had the soil removed to bedrock during sludge removal activities and contained only a small amount of soil in rock cracks and crevices. Therefore, no additional soil removal could be undertaken at this location. A second location containing elevated chromium levels and a third area with high copper levels were removed and disposed with their respective sludges.

The organic soil contamination was primarily limited to VOCs in the "central area" of the Site where noncontainerized wastes had been disposed. This area and two outlying "hot spot" areas were preliminarily treated by soil aeration. Composite sampling indicated that aeration could reduce the levels of the volatile organic chemicals of concern to essentially nondetect levels.

2.3.2 Post-Removal Soil Investigations

Post-removal soil sampling was carried out in March of 1990 at the sampling locations shown in Figure 7. Soil depth currently remaining over the Site can be estimated using the data from post-removal soil sampling. Figure 8 is a contour map of the soil thickness (isopach map). The soil thins around the edges of the Site and the limestone bedrock crops out in several areas on the edge of the Site. The thickest soil is found in the southern part of the Site where it exceeds 9 feet.

2.3.2.1 Organic Analyses

The field samples from the Central Area were analyzed for the four chemicals of concern: 1,1-DCA, 1,2-DCE, 1,1,1-TCA and PCE. The

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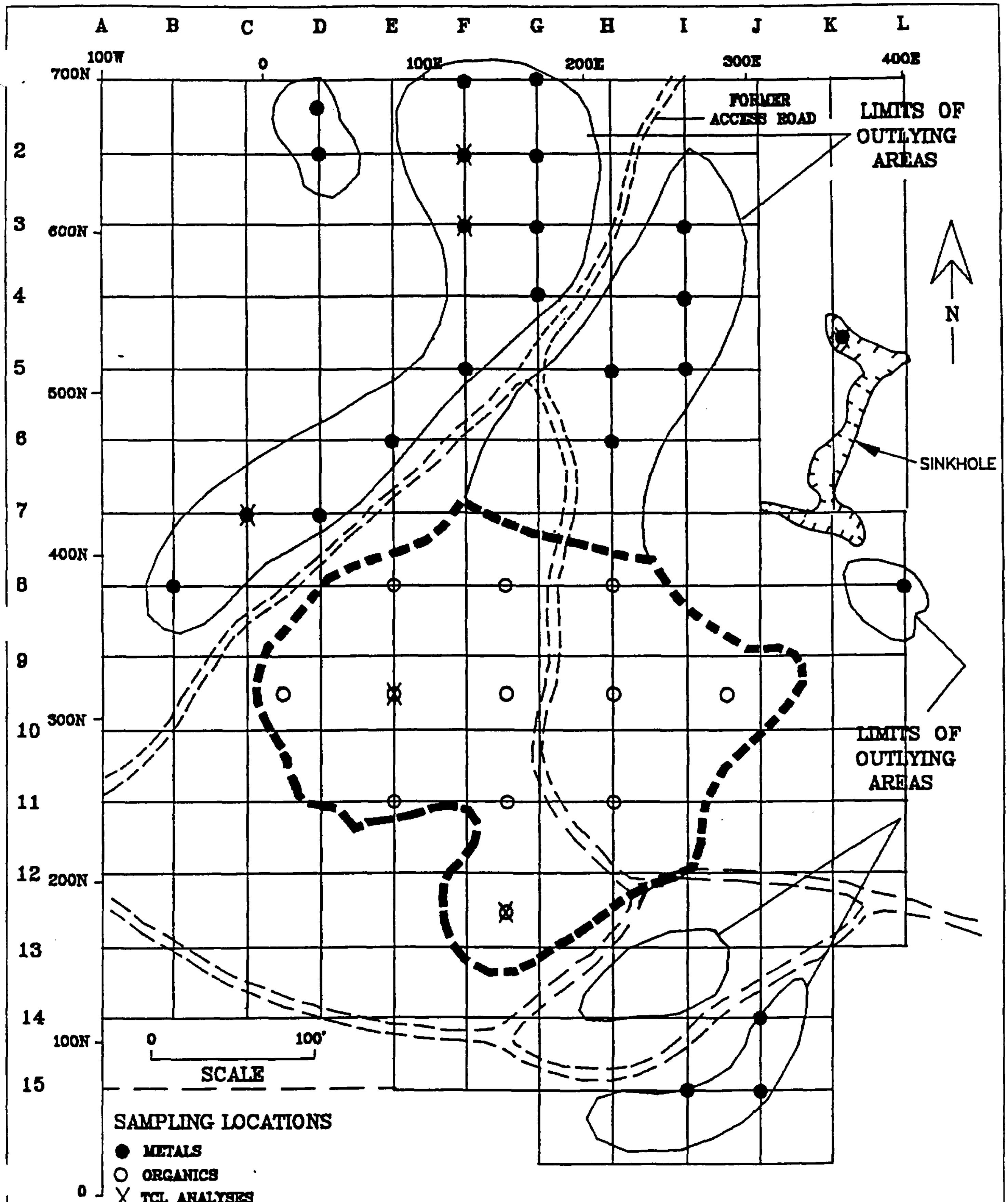

DATE: 7/2/91	**FIGURE 7**	HATCHER–SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	ACTUAL FIELD SAMPLING LOCATIONS	
APPROVED BY: TY		CLIENT NO.: 0064-001

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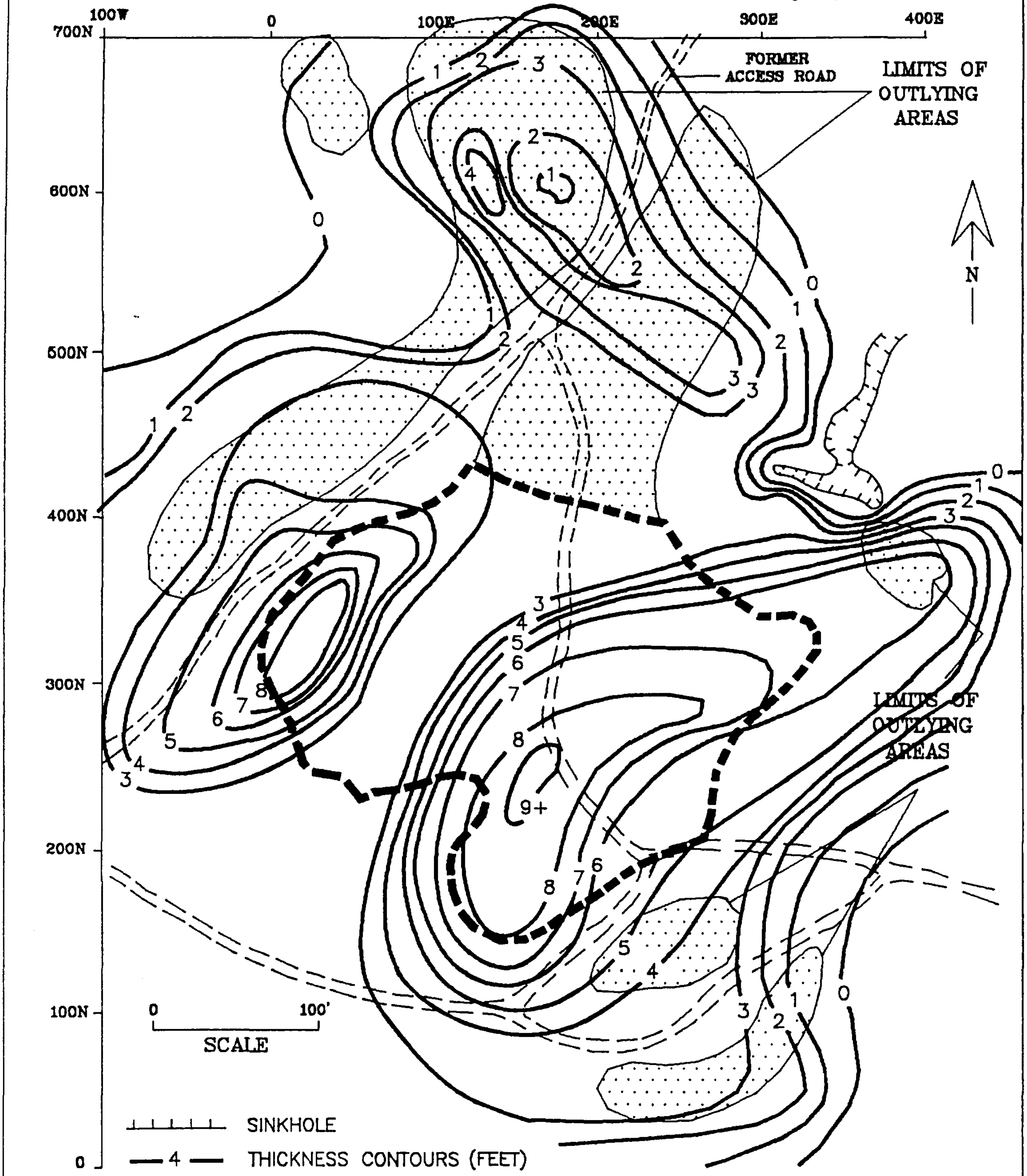

DATE: 7/2/91	**FIGURE 8**	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	APPROXIMATED OVERBURDEN THICKNESS MAP	
APPROVED BY: TY		CLIENT NO.: 0064-001

results of these analyses are listed in Table 3 by sample location and depth. It should be noted that a location designation such as 9.5C.5 3' means a point that lies halfway between north-south increments 9 and 10 (9.5) and halfway between east-west increments C and D (C.5), depth of sample, 3 feet. The alpha-numeric system was adapted to designate the sample location to avoid possible transcription errors due to reversals.

No cleanup goal/soil action limit (SAL) has been established for 1,1-DCA. The only location where it was noted above the detection limit was at 11H at 3 feet where it was detected at 13 mg/kg. In addition, four locations were analyzed for TCL. The results of these analyses are given on Table 4. The organics found to be above acceptable levels are discussed below. It should be noted that during the sampling program, two of the subsurface locations (8E and 9.5C.5) were saturated.

1,2-DCE

No 1,2-DCE was detected above the SAL on the surface or at a depth greater than 6 feet. The distribution of 1,2-DCE above the SAL occurred at Location 11E where the 3-foot samples showed 1,2-DCE at 15 mg/kg and 20 mg/kg (duplicate location).

1,1,1-TCA

No 1,1,1-TCA above the SAL was found in any surface sampling location. Two locations, both at 3 feet, had levels above the SAL; 9.5F.5 at 170 mg/kg and 11H at 340 mg/kg. Only one location at greater than 6 feet was over the SAL, 9.5C.5 at 200 mg/kg.

PCE

The only surface sample over the SAL for PCE was 80 mg/kg taken at 8E. Samples taken at 3 feet showed the broadest spatial distribution of contamination. Samples taken from 8E, 8F.5, 9.5E, 9.5F.5, 11E and 11H exceeded the SAL. Samples taken at depths greater than 3 feet that exceeded the SAL were 8E, 9.5C.5, 9.5F.5 and 11E. No samples deeper than 3 feet were taken at 8F.5, 8H, 9.5E and 11E, due to a high bedrock elevation.

2.3.2.2 Inorganic Analyses

The field samples were analyzed for the three metals of concern: chromium, copper and zinc. The results of these analyses are listed in Table 5 by their sample locations and depths. The locations of these samples were shown in Figure 7. Table 6 lists the levels of all metals found in the eight TCL analyses.

Examination of the data reveals that chromium is the only metal of concern that was found to be in excess of the SAL. The distribution of chromium above the SAL is shown in Figure 9 for the

TABLE 3

SOIL ANALYSES - ORGANICS (mg/kg)

LOCATION	1,1-DCA	1,2-DCE	1,1,1-TCA	PCE	DETECTION LIMIT
2F Surface	ND	ND	0.013	0.180	0.005
2F Bottom(3')	ND	ND	ND	ND	0.010
3F Surface	ND	ND	0.015	0.028	0.005
3F Bottom(3')	ND	ND	ND	ND	0.005
7C Surface	ND	ND	ND	ND	0.005
7C Bottom(3')	ND	ND	ND	ND	0.005
8E Surface	ND	ND	5.8	80	3.4
8E 3'	ND	ND	66	400	31
8E Bottom(5.5')	ND	ND	5.1	66	5
8F.5 Surface	ND	ND	ND	0.503	0.3
8F.5 Bottom(3')	ND	ND	ND	92	10
8H Surface	ND	ND	ND	7	0.33
8H Bottom(2.5')	ND	ND	ND	ND	0.3
9.5C.5 Surface	ND	ND	ND	0.40	0.32
9.5C.5 3'	ND	ND	ND	ND	0.33
9.5C.5 Bottom(9')	ND	ND	200	800	10
9.5E Surface	ND	ND	ND	6	1
9.5E Bottom(3')	ND	0.62	2.7	25	0.63
9.5F.5 Surface	ND	ND	ND	ND	2
9.5F.5 3'	ND	ND	170	53	2
9.5F.5 Bottom(6.5')	ND	ND	ND	10	2
9.5H Surface	ND	ND	ND	ND	2
9.5H 3'	ND	ND	ND	ND	0.33
9.5H Bottom(7.5')	ND	ND	ND	0.55	0.33
9.5I.5 Surface	ND	ND	ND	ND	0.33
9.5I.5 3'	ND	ND	ND	ND	0.33
9.5I.5 Bottom(7.5')	ND	ND	ND	ND	0.33
11E Surface	ND	0.007	0.049	0.180	0.006
11E Bottom(3')	ND/ND	15/20	18/33	20/26	1.9/5.1
11F.5 Surface	ND	ND	0.370	1.40	0.35
11F.5 3'	ND/ND	ND/ND	ND/0.42	ND/0.48	0.33/0.32
11F.5 Bottom(8.5')	ND	ND	0.002	0.006	0.002
11H Surface	ND	ND	ND	ND	2
11H 3'	13	ND	340	38	9
11H Bottom(6')	ND	ND	3.4	3.8	3.2
12.5F.5 Surface	ND	ND	2.9	2.3	0.33
12.5F.5 3'	ND	0.073	0.099	0.044	0.02
12.5F.5 Bottom(9')	ND	ND	ND	ND	0.31
Site Geometric Mean(n=38)	0.15	0.18	0.40	0.88	
Near Surface(n=15)	0.10	0.10	0.21	0.62	
3 Foot Depth(n=15)	0.18	0.26	0.68	0.75	
5-9 Foot Depth (n=8)	0.31	0.31	0.79	1.90	

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TABLE 4

SOIL TCL ANALYSES (mg/kg)

LOCATION	1,1,1-TCA	PCE	1,2-DCE	OTHER ORGANICS*
2F Surface	0.013	0.180	ND	None
2F Bottom	ND	ND	ND	None
3F Surface	0.015	0.028	ND	None
3F Bottom	ND	ND	ND	Butyl benzyl phthalate 0.07J Diethyl phthalate 0.4J 2-Methylnaphthalene 0.06J Naphthalene 0.09J
7C Surface	ND	ND	ND	None
7C Bottom	ND	ND	ND	None
9.5E Surface	ND	6	ND	Bis (2-ethylhexyl) phthalate 0.3J
9.5E Bottom	2.7	25	0.62	Trichloroethene 0.69 Diethyl phthalate 0.1J

1,1,1-TCA = 1,1,1-Trichloroethane
PCE = Tetrachloroethene
1,2-DCE = 1,2-Dichloroethene

*Not found in blanks

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TABLE 5

SOIL ANALYSES - METALS (mg/kg)

LOCATION	CHROMIUM	COPPER	ZINC	CYANIDE
1F Surface	16	12	41	-
1F Bottom	19	7.8	34	-
1G Surface	46	13	76	-
1G Bottom	91	14	120	-
1.5D Surface	680/690	270/390	680/770	-
2D Surface	220	240	260	-
2F Surface	16	7.8	42	ND(0.5)
2F Bottom	16	14	74	ND(0.5)
2G Surface	350	42	360	-
2G Bottom	12	5.7	36	-
3F Surface	170	16	210	0.9
3F Bottom	27	14	131	ND(0.5)
3G Surface	16	9.6	38	-
3I Surface	11/19	17/27	33/45	-
4G Surface	61	12	76	-
4G Bottom	15	6.1	35	-
4I Surface	22	640	51	-
4I Bottom	130	130	130	-
5F Surface	81	21	94	-
5H Surface	34	20	51	-
5H Bottom	33	6.8	49	-
5I Surface	45	180	66	-
5I Bottom	91	8.7	89	-
6E Surface	34	12	62	-
6E Bottom	19/17	8/8.1	46/43	-
6H Surface	19	6.9	41	-
6H Bottom	18	6.6	38	-
7C Surface	110	5.4	110	3.6
7C Bottom	11	7	16	0.6
7D Surface	1700/1800	30/20	1800/2000	-
7D Bottom	140	8.5	120	-
8B Surface	55	7.8	65	-
8B Bottom	15	8	30	-
8L Surface	12	6.4	32	-
8L 3′	13	6.6	32	-
8L Bottom(6.5′)	19	7.2	43	-
9.5E Surface	33	13	55	0.7
9.5E 3′ (Bottom)	53	18	90	ND(0.5)
12.5F.5 5.5′	12	2.1	14	ND(0.5)
14J Surface	19	13	36	-
14J Bottom	18/17	11/9	31/28	-
15I Surface	20	12	52	-
15I Bottom	13	5.8	33	-
15J Surface	20	8.4	33	-
15J Bottom	15	11	31	-
Site Geometric Mean(n=45)	36.2	14.3	63.6	0.48(9)
Near Surface(n=24)	50.8	21.3	83.4	0.87(4)
3-Foot Depth (n=19)	26.3	10.0	50.6	0.31(4)
5-6 Foot Depth (n=2)	15.1	3.9	24.5	0.25(1)

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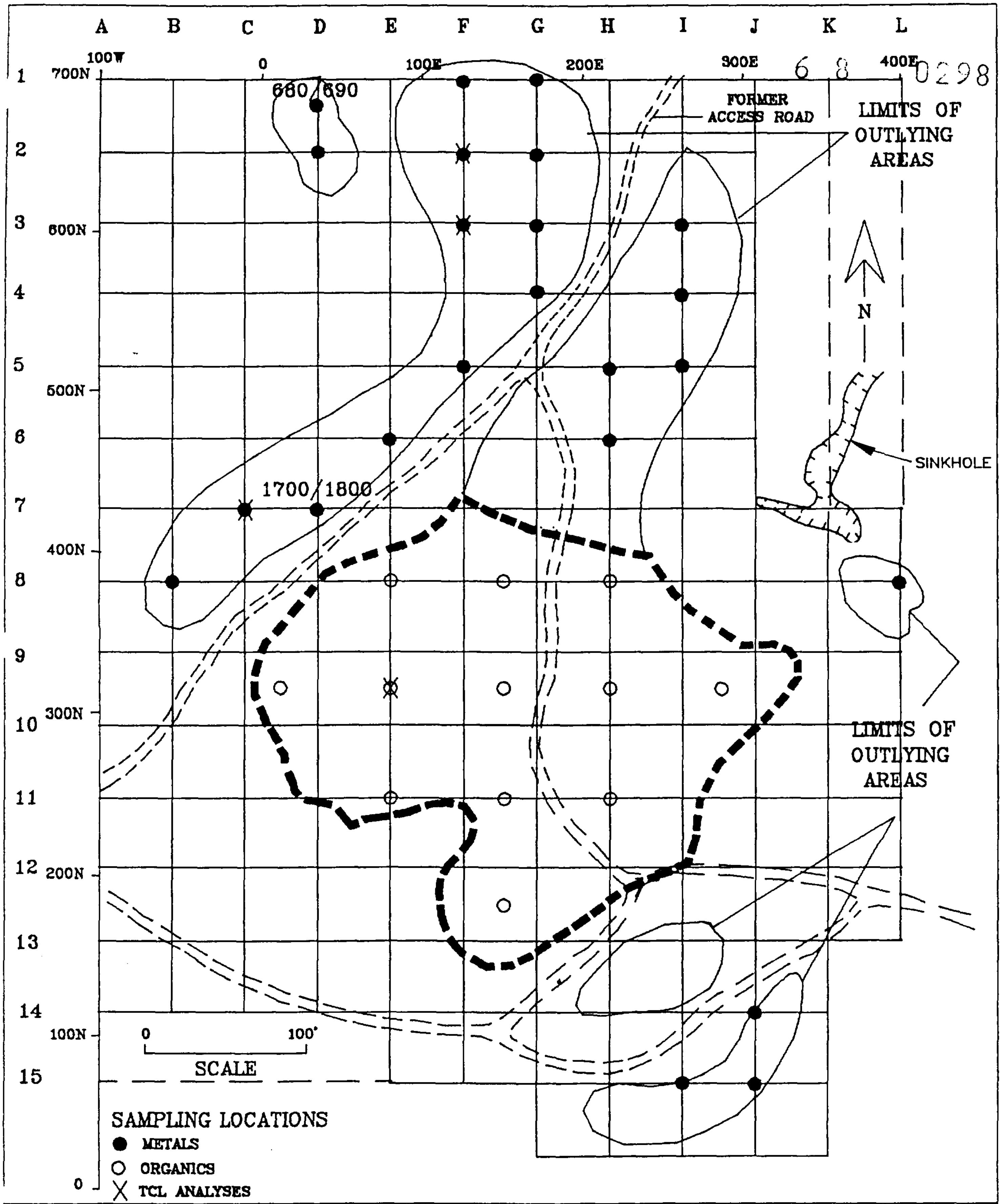
TABLE 6

SOIL TCL ANALYSES - METALS (mg/kg)

METALS	2F SURFACE	2F BOTTOM	3F SURFACE	3F BOTTOM	7C SURFACE	7C BOTTOM	9.5E SURFACE	9.5E 3'
Silver	ND	ND	ND	ND	ND	ND	ND	ND
Aluminum	15000	18000	11000	12000	11000	13000	11000	13000
Arsenic	5.9	6	4	7.9	7.8	3.2	4.6	6
Barium	53	45	53	160	33	96	44	48
Beryllium	0.25	0.25	0.25	3.1	ND	1.4	0.25	0.45
Calcium	1500	1500	2900	4000	1500	2700	2100	12000
Cadmium	ND	ND	ND	1.8	ND	ND	ND	ND
Cobalt	9.3	10	10	12	5.4	15	7.7	7.2
Chromium	16	16	170	27	110	11	33	53
Copper	7.8	14	16	14	5.4	7	13	18
Iron	20000	27000	22000	24000	19000	12000	15000	17000
Mercury	ND	ND	ND	ND	ND	ND	ND	0.26
Potassium	1000	990	780	800	710	1900	610	910
Magnesium	1000	1000	950	820	880	1600	660	870
Manganese	310	430	480	870	230	53	620	430
Sodium	130	110	120	120	120	110	68	80
Nickel	14	18	14	59	9.2	19	8.1	13
Lead	8.2	12	11	14	11	13	17	14
Antimony	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND	2.4
Thallium	ND	ND	ND	ND	ND	6.8	ND	ND
Vanadium	21	25	19	21	15	4	17	19
Zinc	42	74	210	131	110	16	55	90



DATE: 7/2/91	**FIGURE 9**	HATCHER-SAYRE, INC.
DRAWN BY: PDH	INORGANICS SAMPLING LOCATIONS	LEXINGTON, KY
APPROVED BY: TY	SURFACE SAMPLES - CHROMIUM LEVELS (mg/kg) OVER SAL	CLIENT NO.: 0064-001

surface samples. No level of chromium in excess of the SAL was found at depth during the initial sampling. Two surface locations, 1.5D and 7D, have elevated levels, 680/690 mg/kg and 1700/1800 mg/kg, respectively. Coincidently, both samples were taken for duplicate analysis. These points represent two surface "hot spots".

Inorganic soil sampling was intended to be conducted at Locations 1.5D and 7D. Unfortunately, someone had moved one of the grid stakes and the samples were actually taken at Locations 7E.25 and 1.5E.25. Following the return of the laboratory analyses, a trip was made to the Site and the moved stake was discovered. These samples were recollected during January 1992 at the appropriate locations as indicated below.

To delineate the areal extent of elevated chromium levels at the "hot spots", additional soil samples were taken on January 7 and February 7, 1992. These points were situated 10-40 feet from the center of each of the "hot spots" along the previously established lines (Figure 10). Field sampling was accomplished by utilizing the existing grid and measuring out from the original sampling points (7D and 1.5D) in the direction of the grid lines (N-S,E-W) at 10-foot intervals. A total of 27 soil samples were collected on January 7, which included nine surface samples associated with each area of interest and nine subsurface (bottom) samples at Location 7D. On February 7, an additional six surface and six subsurface samples were taken at 7D. Sampling Location 1.5D has 12 inches of cover or less and, therefore, only surface samples were collected at this location, about 6-12 inches below ground surface. The subsurface samples collected at Location 7D were just above bedrock, about 3 feet below ground surface.

All samples were taken according to USEPA Region IV protocols. The samples were analyzed for chromium, copper and zinc. The results of these analyses are shown in Figure 11. The detailed procedures used are described in the RD Sampling and Analysis Plan submitted October 18, 1991.

2.3.2.3 Cyanide Analyses

In addition to the organic and metal chemicals of concern, four locations were analyzed for the TCL substances (Figure 7). Table 5 lists the results of the cyanide analyses at five soil sampling locations. Cyanide was detected in four of the nine samples. Three of the four samples had concentrations of less than 1 mg/kg. The highest level was 3.6 mg/kg at 7C (Surface), significantly below the calculated health-based level of 1,600 mg/kg for soil. The occurrence of cyanide is questionable, especially at the lower levels, since some of the field blanks contained cyanide. Additionally, its occurrence did not correspond to the metal concentrations, since two of the four samples had metal concentrations well within the background soil samples from the Site. The other two samples had slightly elevated levels of

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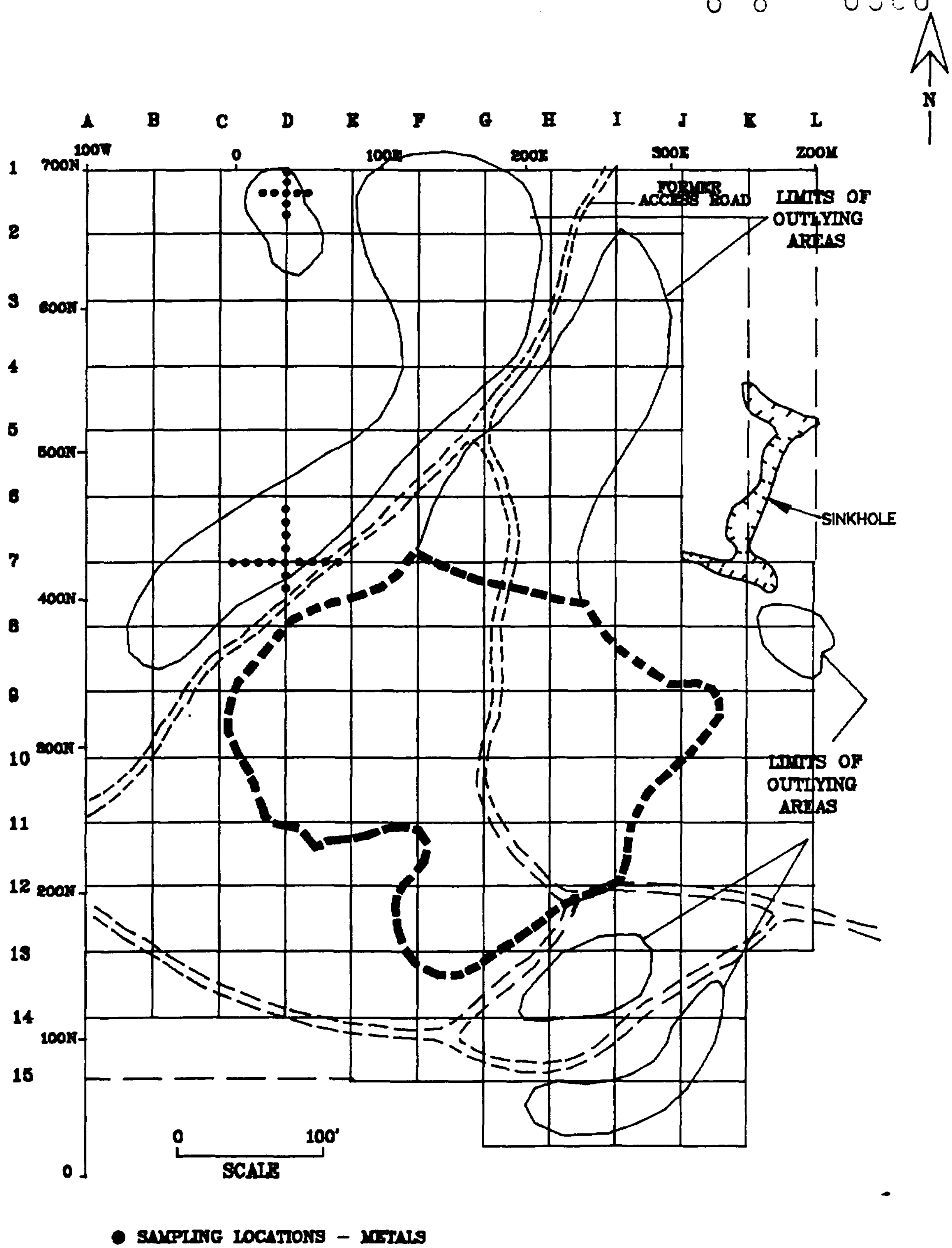

DATE: 2/12/92	FIGURE 10	HATCHER–SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	REMEDIATION – PHASE I SAMPLING LOCATIONS – HEAVY METALS	
APPROVED BY: MAL		CLIENT NO.: 0064–001

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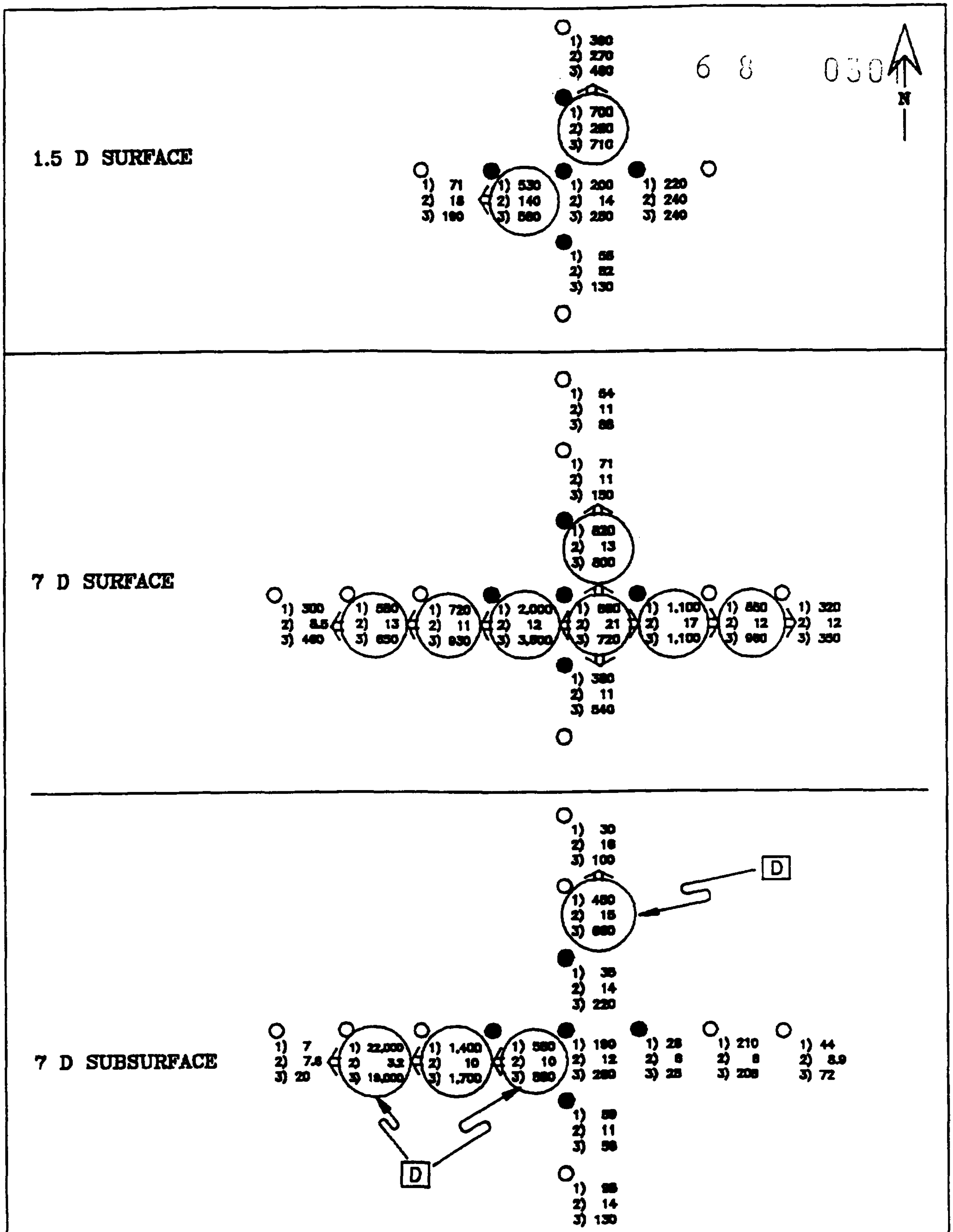

● Sampling Points
○ Supplemental Sampling Points

1) CHROMIUM mg/kg
2) COPPER mg/kg
3) ZINC mg/kg

D Discoloration was noted while drilling

DATE: 3/4/92	FIGURE 11	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	RESULTS OF RD/RA SAP INORGANICS ANALYSES	
APPROVED BY: MAL		CLIENT NO.: 0064-001

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chromium and zinc, however, the on-site laboratory screening for the blue-gray sludge did not indicate the presence of cyanide. If it actually exists at these locations, its source is unknown.

2.3.3 Post-Removal Groundwater Investigations

Three dye trace investigations have been conducted at the Howe Valley Site. All three were conducted under different hydrologic conditions, but the findings all indicate that essentially all of the water entering the on-site sinkhole travels through a conduit system and emerges at Boutwell Spring.

The first investigation was undertaken by the KNREPC during 1979. During this investigation, although it did not pinpoint Boutwell Spring, the State detected dye at the first Linders Creek monitoring point below Boutwell Spring 8 days after dye introduction. The estimated travel time through the system (about 1 foot/minute) indicates moderate flow conditions.

The second dye trace was conducted by Hatcher-Sayre, Inc. (formerly Hatcher Incorporated) in 1988 during drought conditions. This investigation pinpointed Boutwell Spring as the point of dye emergence following detection at the three downstream Linders Creek monitoring locations. The estimated travel time during this low-flow period was 0.2 feet/minute.

The third dye trace was carried out under high-flow conditions during the spring of 1990. This investigation indicated, as did the two previous studies, that Boutwell Spring was the single emergent point for water entering the Howe Valley Landfill on-site sinkhole. During this high-flow period, dye was detected at Boutwell Spring in less than 24 hours, indicating a travel time of about 7 feet/minute.

The post-removal groundwater sampling consisted of sampling Boutwell Spring and Pirtle Spring. As indicated above, Boutwell Spring is the only point of water discharge from the on-site sinkhole as indicated by the three dye trace studies. The water samples were collected on March 14, 1990, during which time the flow rate was estimated at 250 gpm (0.56 cfs).

The analytical results of the Boutwell Spring water indicated no detectable amounts of acid/base/neutral extractable organics, PCBs, pesticides or VOCs. All of the metal analyses were within the limits of USEPA Drinking Water Standards.

There was a trace amount of cyanide detected in the Boutwell Spring water (0.006 mg/L). Laboratory or field contamination is suspected because the field blank collected prior to any sampling indicated 0.008 mg/L of cyanide.

The analysis of the Pirtle Spring water showed no detectable VOCs, pesticides, PCBs or acid/base/neutral extractable organics. 1,4-dichlorobenzene was detected but it was also found in the method blank for this sample. Thus, the detection of this organic compound was attributed to laboratory error.

No elevated concentrations of metals (including chromium, copper and zinc) were detected in either sample.

3.0 ORGANIC CONTAMINANT REMEDIATION

The anticipated remedial action for organically-contaminated soils as per the RD Work Plan is to aerate the soil on-site according to the Pilot Treatability Study. The design phase has been broken down into four general categories:

- Data Acquisition Activities
- Design Criteria Report
- Plans and Specifications
- Permitting Requirements

3.1 DATA ACQUISITION ACTIVITIES

The selected remedy for the Site will address the contamination remaining in the on-site soils and contamination that could be released into the groundwater. The principal threat to human health and the environment is from the possible ingestion of or dermal contact with the contaminated soils. A secondary threat would be from ingestion of contaminated groundwater. Currently, groundwater samples taken at Boutwell Spring indicate that contamination is below the MCLs or health-based levels.

The selected remedy is anticipated to involve the following specific activities:

- Implementation of a Bench-Scale Treatability Study to ensure that the aeration process will reduce organic concentrations to acceptable levels;
- Implementation of a Pilot Treatability Study to establish that the Bench-Scale Treatability Study results are applicable to the site-specific field conditions;
- Installation of water diversion ditches to prevent water from running onto the aerating soils;
- Construction of an on-site water treatment system to treat water collecting in the excavation pits;
- Investigation of the organic liquid contamination extent in the bottom of the excavation pit which was discovered during the Pilot Treatability Study;
- Excavation and treatment, via on-site aeration, of approximately 7,100 cubic yards of central area soils that contain elevated concentrations of organics (Figure 12);
- On-site air monitoring to ensure adequate protection of workers and nearby residents; and
- Revegetation of the Site to restore its natural conditions.

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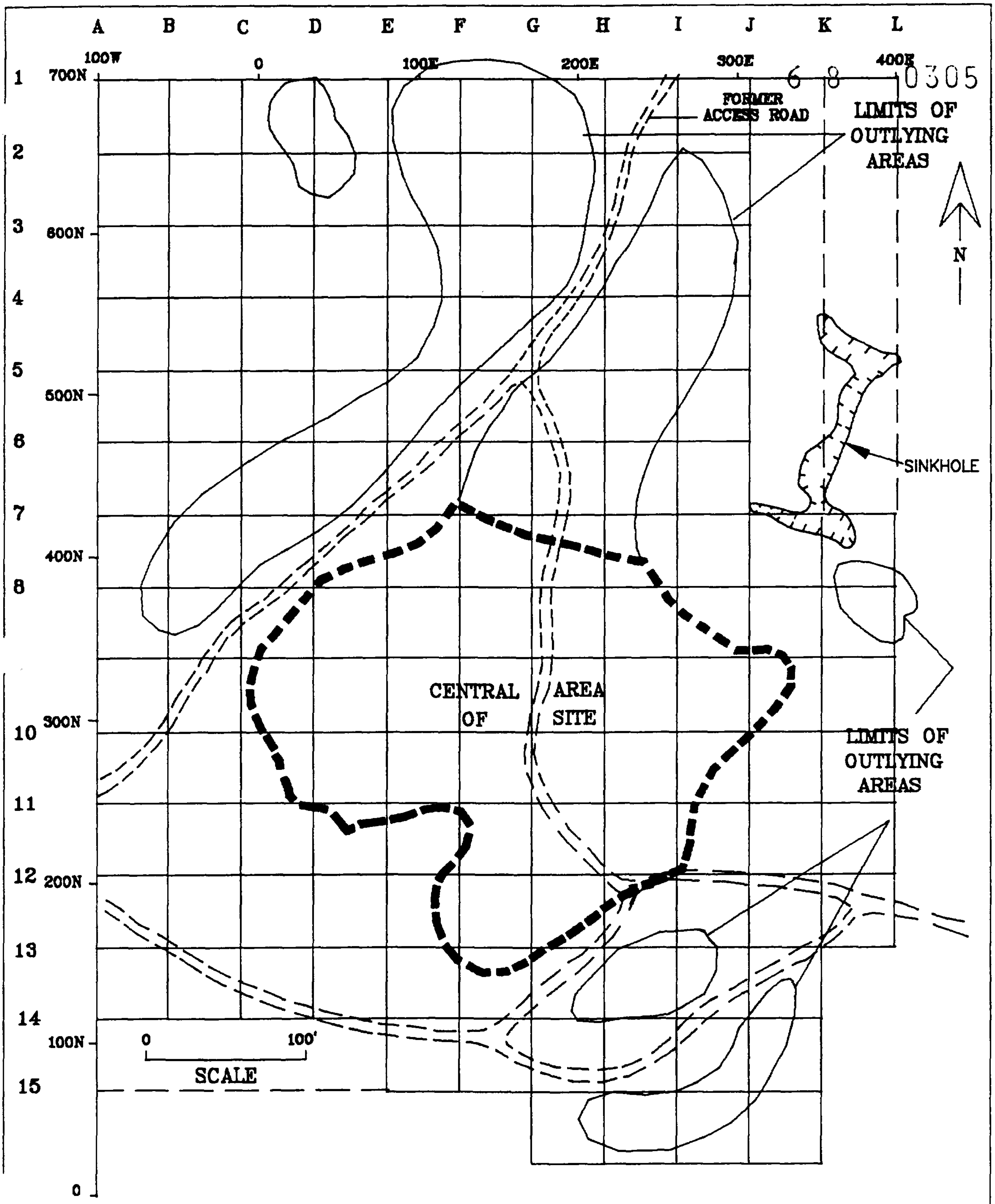

DATE: 8/14/92	**FIGURE 12**	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	AREA OF ORGANIC CONTAMINATION	
APPROVED BY: MAL		CLIENT NO.: 0064-001

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3.1.1 Bench-Scale Treatability Study

The Bench-Scale Treatability Study has been conducted by the Dragun Corporation, Farmington Hills, Michigan. Based upon the Bench-Scale Treatability Study results, Dragun Corporation concluded:

- First, most of the PCE volatilized from Howe Valley soils a few hours after the study began. Under static air conditions, a volatilization rate of 41 mg PCE/m^3/minute was determined.

- Second, smaller concentrations of PCE volatilize from the soil at a relatively lower rate.

- Third, PCE volatilization from low moisture content soil is somewhat faster than from high moisture content soil. The high moisture soil formed lumps which did not mix well, leading to unequal distribution of the PCE and to less soil exposure to the atmosphere.

- Fourth, the results of this study show that the proposed remediation plan, which involves soil rototilling, should release VOCs from Howe Valley soils; residual VOC concentrations in these soils should be well below the SALs.

3.1.2 Pilot-Scale Treatability Study

The Bench-Scale Treatability Study tests conducted by Dragun provided validation for the aeration technology. The objective of the pilot field test was to confirm the effectiveness of the final RD under actual field conditions. It also served to identify problems with design operations and testing procedures.

The Pilot-Scale Treatability Study was conducted at the Howe Valley Landfill Site in Hardin County, Kentucky from mid-September to mid-October 1992. During the nearly 6-week long Pilot Study, approximately 2,000 cubic yards of soil were successfully treated. As had been indicated in earlier studies, the PCE represented the most difficult contaminant of concern to treat at the site. The concentration of this compound, however, was consistently treated below 1 ppm compared to the SAL of >7.5 ppm. All of the other chemicals of concern were consistently below detection.

As the Bench-Scale Treatability Study indicated, moisture considerably slowed down the on-site treatment. The moisture tends to "clump" the clayey soils together, thereby reducing the soils exposure to the air. Unfortunately, the Site experienced one of the highest rainfall years ever recorded in Kentucky's history. This, along with weekly rainfall during the Pilot Study, substantially increased the need for additional aeration time.

To improve the overall treatment efficiency, stockpiles were created adjacent to the excavation areas. This allowed the stockpiled soil to begin drying out prior to being moved to the aeration areas. Additionally, a third aeration area was approved by EPA which will allow more treatment per unit time. In conjunction with this new aeration area, a second tractor and rototiller will be utilized for accelerating treatment.

Overall, the Pilot Treatability Study was very successful. Other than the above described changes to improve the efficiency of the operation, the overall Organic Design Remediation Plan should be adequate as proposed.

3.1.3 Remedial Technology Description

The remedial technology consists of exposing the contaminated soil to the air so that volatilization can occur (physical phase change). PCE is quite volatile and, as a result, is rapidly transported to the troposphere. Once in the troposphere, hydroxyl radicals attack the double bond, resulting in the subsequent formation of trichloroacetylchloride as the principal initial product (Andersson et al. 1975; Hanst 1978; Environmental Protection Agency 1975; Gay et al. 1976). These compounds are readily hydrolyzed at ambient conditions (Morrison and Boyd 1973). PCE, however, is attacked by hydroxyl radicals more slowly than most other olefin pollutants due to the presence of four chlorine atoms (Environmental Protection Agency 1975). According to Yung et al. (1975), the tropospheric lifetime of PCE, based on its rate of reaction with hydroxyl radicals, is reported to be 8.5×10^5 seconds, corresponding to a lifetime of about 10 days. [EPA 1979]

The most important aspect of the aeration technology is maximizing the surface exposure of the contaminated soil. The rototiller is utilized to break down the dirt "clumps" and increase surface exposure. Volatilization occurs faster during hot, dry weather conditions. Due to the high clay content in the soil, high moisture content tends to inhibit break down of the clumps. Moisture, therefore, reduces surface exposure and increases the required aeration time.

High moisture content of the soil did reduce the efficiency of the remedial action during the Pilot Study. To improve efficiency, the soil was excavated prior to aeration and stockpiled in the central area of the Site to predrain the soil to the extent possible. The two aeration areas were expanded and a third area was prepared for use during the final remediation phase. Both of these changes are expected to improve the overall efficiency of the remedial operations.

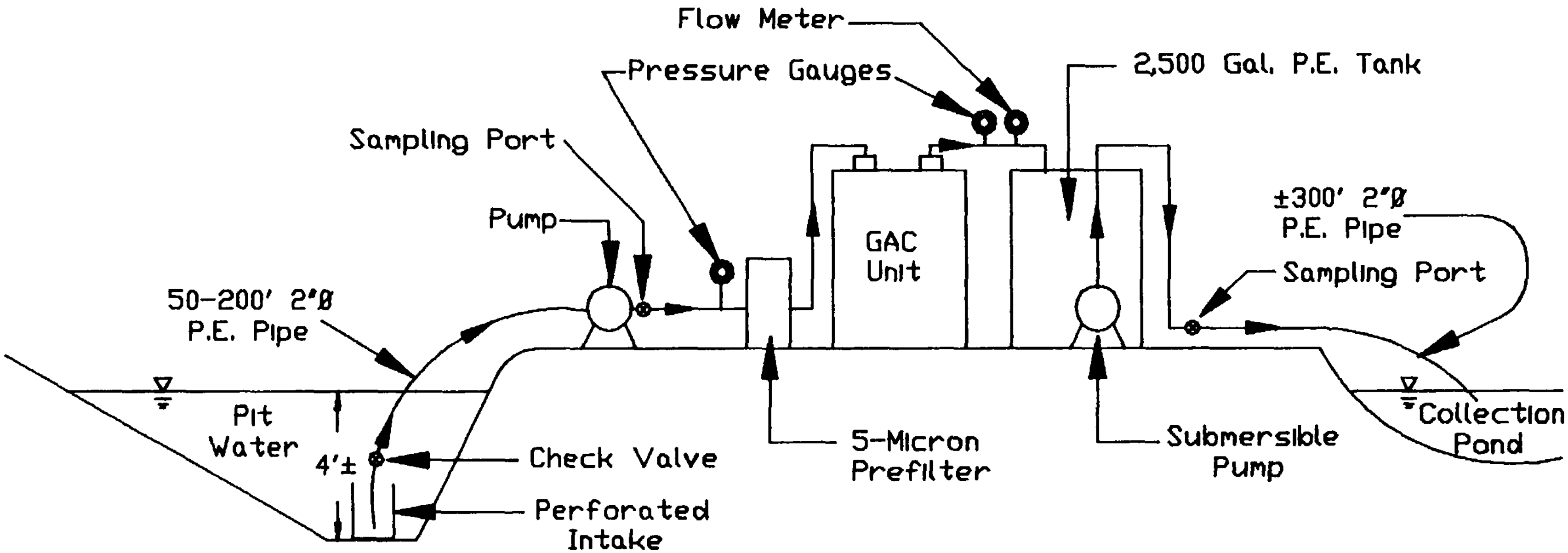
3.1.4 Experimental Design And Procedures

The RA will essentially follow the design and procedures utilized as part of the Pilot Treatability Study. The program will consist of three separate phases. Phase I consists of site preparation and will include leveling and preparing the aeration and stockpile areas as well as constructing the drainage areas and retention ponds. The bulk of this work was completed during the Pilot Treatability Study. As a result of the Pilot Study, additional Phase I activities were defined. Phase I was extended to include water treatment of the water which collected in the excavation pits and an investigation of the organic liquid discovered in the excavation during the Pilot Study.

During the Pilot Treatability Study, numerous rainfall events produced several thousand gallons of water in the excavation pit. This coupled with the discovery of an organic liquid near the bottom of the initial pit necessitated the treatment of this pit water. A separate water treatment work plan was developed and approved by EPA (Final RD/RA Water Treatment Work Plan, January 8, 1993). A schematic of the water treatment system is presented on Figure 13. It essentially consists of pumping the water from the pit through a 5-micron filter to an activated carbon unit. The treated water will be temporarily stored in a 2,500-gallon container prior to being pumped to a constructed holding pond on the Site.

The second activity necessitated as a result of the Pilot Study is the investigation of the organic liquid. This material was discovered floating on the water in the excavation pit following initial excavation activities. The source of this material is currently unknown. Its discovery, however, was in the general vicinity of a reported trench which was investigated during the RI, but could not be identified or located. An "oily" liquid was reportedly discharged into the trench when the landfill was still operating during the 1970s. A separate organic liquid work plan was developed and subsequently approved by EPA (Final Organic Liquid Investigation Work Plan, January 12, 1993). The study essentially consists of collecting soil column samples to bedrock for initial field screening with the FID meter and subsequent laboratory analysis of the TCL volatile and semivolatile organic compounds. Final confirmation will be excavation to bedrock and examination of the excavated materials.

Phase II, treatment of the contaminated soil on-site, will be conducted in stages on the central area of the Site as shown on the Organic Contaminant Remediation Site Plan (Technical Specifications Plan Sheet attached). This area was defined on the basis of concentrations exceeding the proposed SALs for the three contaminants of interest. Generally, the treatment procedure will involve excavating the central area, transporting the soil and stockpiling it at one of the three stockpile areas, moving the soil from the stockpiles and depositing it in the designated aeration areas and then aerating the soil. When the VOC concentrations in the soil are confirmed to be below the SALs, the soil will be stockpiled in the treated soil stockpile area. The detailed



DATE: 1/6/93	**FIGURE 13**	**HATCHER-SAYRE, INC.** **LEXINGTON, KY**
DRAWN BY: PDH	**WATER TREATMENT FLOW SCHEMATIC**	
APPROVED BY: MAL		**CLIENT NO.: 0064-001**

treatment method will consist of the following steps:

1. Excavation Area: The anticipated soil treatment area is shown on the attached plan sheet, Organic Contaminant Remediation Site Plan, as Areas 1 through 11. Each area is anticipated to be approximately 100 to 200 feet long and 15 to 50 feet wide. The depth of each area will vary depending upon the existence of contamination, depth to bedrock or depth to undisturbed soil. The bottom of the excavation will be monitored with a PID or FID meter. Since the air concentrations are generally several times higher than soil or water concentrations at equilibrium, soil headspace readings on 50-foot centers or less consistently averaging below 10 ppm should be well below the SALs (see Addendum). At this time, samples will be taken from the floor of the excavation on about 50-foot centers and analyzed off-site by an approved CLP laboratory for the target VOCs in order to confirm concentrations.

2. Soil Excavation: Soil treatment excavation operations will utilize a trackhoe and dump truck. The trackhoe can remove the soil from the trench, deposit it in the truck and the truck will haul it to one of the three stockpile areas (see plan sheet). A loader will then spread the soil from the stockpiles in approximately 9-inch lifts within the aeration areas. A small dozer may be utilized to "windrow" the soil to prevent compaction by the tractors. Moisture will be added only when necessary for dust suppression and since it inhibits volatilization, will be used sparingly. Substantial stormwater, which collects in the excavated areas, will be pumped to the on-site treatment system for treatment.

3. Soil Treatment - Aeration: The soil placed in the aeration areas will be aerated continuously using farm tractors with rototiller attachments to break up clods of contaminated soil as much as possible and to enhance natural surface aeration. During the aeration period, surveys with a PID or FID meter will be performed periodically until total organic vapor concentrations are consistently below 10 ppm. At this time, additional samples will be taken for off-site analysis for the target compound VOCs. Samples will be collected on 50-foot centers (see Appendix A, FSAP). The treated soils will then be redeposited in one of the two clean stockpile storage areas (see plan sheet).

4. Documentation of Weather Conditions: Weather conditions will be documented during the remediation activities. A wind sock will be utilized to assess wind direction and air and ground temperatures will be recorded. A rain gauge will be set up to measure amounts of precipitation. These measurements will be recorded in the field logbook.

The final phase, Phase III, will consist of the Site closeout activities. This will consist of leveling, recontouring and

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revegetating the Site. Following removal, treatment and confirmation analyses, the stockpiled, aerated soil will be redeposited into the excavated areas and compacted. The treatment areas will be contoured to control runoff and the entire area will be revegetated as part of the final phase of remediation.

3.1.5 Materials and Equipment

The materials and equipment utilized for this phase of the project will be limited to those which are necessary for the excavation, aeration, stockpiling and hauling of contaminated soil on-site. Based upon the Pilot Study, it is anticipated that a front-end loader, a small dozer and trackhoe will be used for excavation and stockpiling; a 20 cu. yd. dump truck will be used to haul the soil to the aeration areas and stockpiles; and two tractors/rototillers will be used for aeration. Additional materials and equipment will be required for dewatering excavation areas, treating water, decontaminating equipment, drainage control and seeding. Prior to demobilization, all equipment that was in direct contact with the contaminated soil will go through a decontamination process as indicated in the HASP.

Field sampling and analysis equipment will include calibrated PID and/or FID meters, explosives (LEL) meter, decontaminated steel trawls, spoons, pans, bowls and hand augers, as well as the required containers, labels, chain-of-custody forms, etc.

3.1.6 Sampling And Analysis

Sampling and analysis will be conducted in accordance with the FSAP. It essentially consists of monitoring the progress of the treatment (field screening) and verification that the soils have been sufficiently treated (confirmation sampling). The QA/QC data quality objectives (DQOs) for the actual verification of treatment will be at Level IV. The field screening methods will utilize an analytical level of Level I.

3.1.7 Data Management/Analysis And Interpretation

Bound, weatherproof, field notebooks will be maintained by the field team. Team members will record all information related to sampling, weather conditions, unusual events, field measurements, etc. The pages in the field notebook will be numbered consecutively and each sampler will sign the field notebook for verification of the entries. The field notebooks will be kept in secured storage to maintain their integrity for future reference.

A special form will be used to record the PID/FID field screening data (see Appendix A, FSAP). Sample labels and the chain-of-custody forms will be as described in the FSAP. With regard to laboratory data, Hatcher-Sayre, Inc. will review the raw data and QA/QC samples to identify any inconsistencies. Laboratory verification of any apparent discrepancies will be required prior to submittal to USEPA.

Data analysis and interpretation will be relatively straightforward. The analyses should indicate that the treatment technology will consistently produce contaminant levels below the SALs.

3.1.8 Health And Safety

A health and safety plan for the organic design is attached as Appendix B. Essentially, the plan indicates that the associated risk at the Site is quite low. The primary risk source is exposure to select organic contaminants from volatilization from the contaminated soil. Due to the anticipated low associated risk, Level C protection will be utilized initially and upgraded, if necessary and as appropriate.

3.1.9 Schedule/Reports

It is anticipated that the Organic Remedial Action will have a duration of less than 3 months. If, for any reason, it extends beyond the anticipated 3-month time frame, the status and data collected will be reported in the scheduled monthly report. Following the completion of the Organic Remedial Action, a draft report will be prepared and submitted to EPA describing the study, presenting and discussing the results, and documenting the findings as indicated in Section 10, Project Closeout.

3.1.10 Management And Staffing

Management and staffing for the Organic Remedial Action portion of the project will remain similar to the rest of the project. The organization and lines of authority and communication are shown in Section 5, Project Management Plan. Hatcher-Sayre, Inc. will provide technical and field management assistance to Dow Corning for this phase of the project. Hatcher-Sayre's Project Manager will have responsibility for proper implementation of the plan on behalf of Dow Corning Corporation. The Project Manager will delegate on-site activities to Hatcher-Sayre's Field Supervisor to undertake the specific on-site activities described in the Plan. The Quality Assurance Manager will undertake inspections, review project documents and undertake additional sampling as required to assure that QA procedures are being adhered to and are in accordance with the plans and specifications.

The Field Supervisor will schedule pre-approved subcontractors and report to the Project Manager on a daily basis. Problems encountered on-site which may have the potential to change specific elements of the Plan will be communicated to the Project Manager as soon as they are identified. The Project Manager will, in turn, report these potential changes to Dow Corning and develop documentation for requesting any changes to the Plan, which must be approved in writing by EPA.

3.2 DESIGN CRITERIA REPORT

This section is intended to provide concepts, assumptions and parameters necessary to support the technical aspects of the design. This can be separated into six distinct areas which will more specifically describe the project as shown below.

3.2.1 Waste Characterization

The post-removal waste can be characterized into two distinct groups, organic and inorganic. The organic wastes remaining on-site include 1,1-DCA, 1,2-DCE, 1,1,1-TCA and PCE. The aspects of each are more fully described in Section 2.3.2.1. The concentrations of these four parameters, as they relate to the Site layout, are shown in Table 3.

3.2.2 Volume Requiring Removal

The volume of soil to be excavated will be estimated assuming that the verification samples indicate clean conditions and there are no additional "hot spots" found during excavation. The surface area of excavation will be approximately 38,500 sq. ft. The depth of contamination varies, therefore, for the sake of calculation, an average depth of 5 feet will be assumed. Based on this, approximately 7,100 cu. yd. of soil will be excavated and aerated. This total does not include soil that will be used for backfill as well as incidental earthwork that may be necessary, such as berms, drainage ditches and grubbing. The excavation procedures are more fully described in the Technical Specifications (Appendix C).

3.2.3 Waste Disposal

Since the treatment of soil will be handled entirely on-site, waste disposal will be limited to solid waste generated or excavated during the remediation procedures. Upon completion of the RA, this waste will be disposed in a properly equipped landfill.

3.2.4 Field Sampling Plan

Sampling and analysis will be conducted in accordance with the FSAP. It essentially consists of monitoring the progress of the treatment (field screening) and verification that the soils have been sufficiently treated (confirmation sampling). A monitoring program for VOCs with a FID/PID meter will be established at the downwind site boundary. Boundary measurements will be taken if unusually high readings are monitored during the on-site treatment process, but at a minimum of two times a day. If levels exceeding 50 ppm total VOCs (one-half of the lowest permissible exposure level for the chemicals of interest) are measured, then work will cease and the aeration practices will be re-evaluated. Dust particulates will be monitored visually to assure that none leave the Site. If dust does become a problem, a water truck will remain on standby at the Site to water down the dry areas.

3.2.5 Materials and Equipment

During the previous waste removal activities, both electric and telephone lines were extended to the Site. If needed, the contractor will be responsible for contacting the local utility companies to arrange for service. Potable water is not available on-site, therefore, it will be necessary for the contractor to arrange for water service for drinking and/or washing purposes. Other facilities necessary at the Site, such as waste disposal or sanitary facilities, will be in accordance with the HASP.

The materials and equipment utilized for this phase of the project will be limited to those which are necessary for the excavation, aeration, stockpiling and hauling of contaminated soil on-site. Based upon the Pilot Study, it is anticipated that a front-end loader, a small dozer and trackhoe will be used for excavation and stockpiling; a 20 cu. yd. dump truck will be used to haul the soil to the aeration areas and stockpiles; and two tractors/rototillers will be used for aeration. Additional materials and equipment will be required for dewatering excavation areas, treating water, decontaminating equipment, drainage control and seeding. Prior to demobilization, all equipment that was in direct contact with the contaminated soil will go through a decontamination process as indicated in the HASP.

3.2.6 Performance Standards

The standards of performance will be judged based upon the ability to meet the individual SALs. The required concentrations, as defined by the ROD for the three primary constituents, are as follows:

Compound	Soil Action Level
1,2-DCE	7.72 mg/kg
1,1,1-TCA	117.3 mg/kg
PCE	>7.50 mg/kg

Excavation will not be considered complete unless these limits are met. In addition, this phase of the operation will not be considered complete until the final grades have been achieved and a vegetative cover has been established.

3.3 PLANS AND SPECIFICATIONS

A set of plans and specifications for the earthwork operations is shown in Appendix C. Specifications include the performance standards to be used on the project as well as the construction procedures necessary to complete the earthwork, hauling and revegetation. In addition, the plans have been stamped and signed by a professional engineer licensed in the Commonwealth of Kentucky.

3.4 PERMITTING REQUIREMENTS

Section 121(d) of CERCLA, as amended by SARA, requires that remedial action at CERCLA sites comply with requirements or standards under federal and state environmental laws that are "applicable or relevant and appropriate" to the hazardous substances, pollutants or contaminants at a site. There are three types of ARARs; contaminant-specific, location-specific and action-specific. Since the Site is not within a 100-year floodplain, contains no wetlands or critical wildlife habitats, does not possess registered historical or archaeological sites, etc., location-specific ARARs are not applicable. Contaminant-specific and action-specific ARARs which may be applicable can be broken down into five general categories; land, air, water, occupational safety and health, and transportation.

3.4.1 Land Requirements

Section 121(e) of CERCLA waives all permitting requirements from federal, state or local governments for any portion of removal or remedial actions conducted entirely on-site and in compliance with the cleanup remedy selected.

3.4.2 Air Requirements

Existing RCRA regulations covering hazardous waste air emissions are limited to controls of incinerators and requirements for controlling windblown fugitive particulate matter (dust) from landfills, waste piles and land treatment facilities. To control dust emissions, the waste stockpile will be covered with plastic and work areas will be watered as necessary. The excavated areas will be monitored for organics using an OVA or PID and LEL meter to assure the health and welfare of all humans, animals and plants, as per 401 KAR 63.

3.4.3 Water Requirements

Due to the surface drainage structures previously constructed on-site, as well as the additional precautions taken during this phase of the project, i.e., retention ponds, berm reconstruction and erosion controls, there should be no surface water discharging off-site from the work areas. In addition, it has already been demonstrated that, to this point, the groundwater in the area has not been adversely affected by this site. Therefore, permitting will not be necessary and activities at the Site should present little or no potential for endangerment to the environment or human health and welfare.

3.4.4 Occupational Safety And Health Requirements

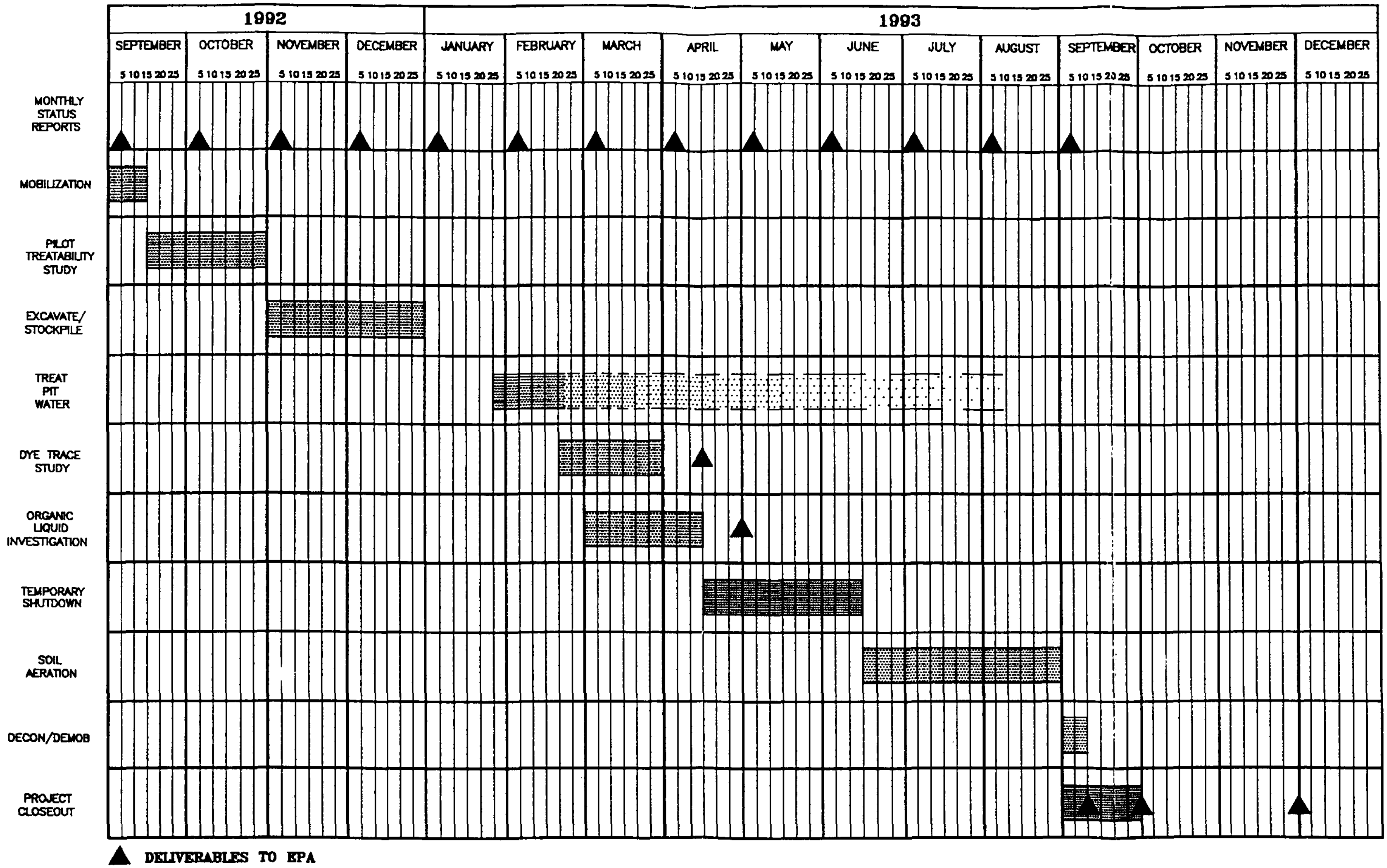
All OSHA regulations relating to earthwork will be in effect during the excavation process. These include, but are not limited to, site worker safety as stipulated in 29 CFR 1910, 20 CFR 1926 and 29 CFR 50. State requirements, such as 803 KAR 2, will also be enforced. In addition, all embankments will be benched to ensure that there are no vertical faces in the excavated area greater than 4 feet in height as per the latest OSHA confined space regulations.

3.4.5 Transportation Requirements

Since there will be no material traveling off-site other than solid waste generated at the Site, there will be no permits required other than what is necessary for solid waste. The only exception to this would be waste found during the aeration process, such as cured silicone rubber, drum lids, etc., that could be classified as special waste.

4.0 CONSTRUCTION SCHEDULE

A construction schedule for the activities involved in the remediation of organic contaminants is shown in Figure 14. Mobilization is anticipated to begin immediately upon approval of the removal procedures by USEPA since the Pilot Treatability Study will be in progress. Additional excavation will be required if verification samples should indicate VOC levels above the SAL. Therefore, the schedule, as shown, is tentative dependent upon the field and weather conditions encountered.



DATE: 1/21/93	FIGURE 14	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	ANTICIPATED PROJECT SCHEDULE FOR COMPLETING THE REMEDIAL ACTION	
APPROVED BY: JDK		CLIENT NO.: 0064-001

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5.0 PROJECT MANAGEMENT PLAN

The purpose of the Project Management Plan is to provide structure or organization to the project to ensure that the overall project objectives are met and quality is maintained. The project organization for the Howe Valley RA activities is depicted in Figure 15. This chart signifies the lines of authority and communication among the various participants in the project.

Dow Corning Corporation is central to the organization for the Howe Valley Landfill Site since it has assumed overall responsibility for the conduct of the RD/RA activities. These activities are to be carried out in accordance with a Consent Agreement between Dow Corning and EPA.

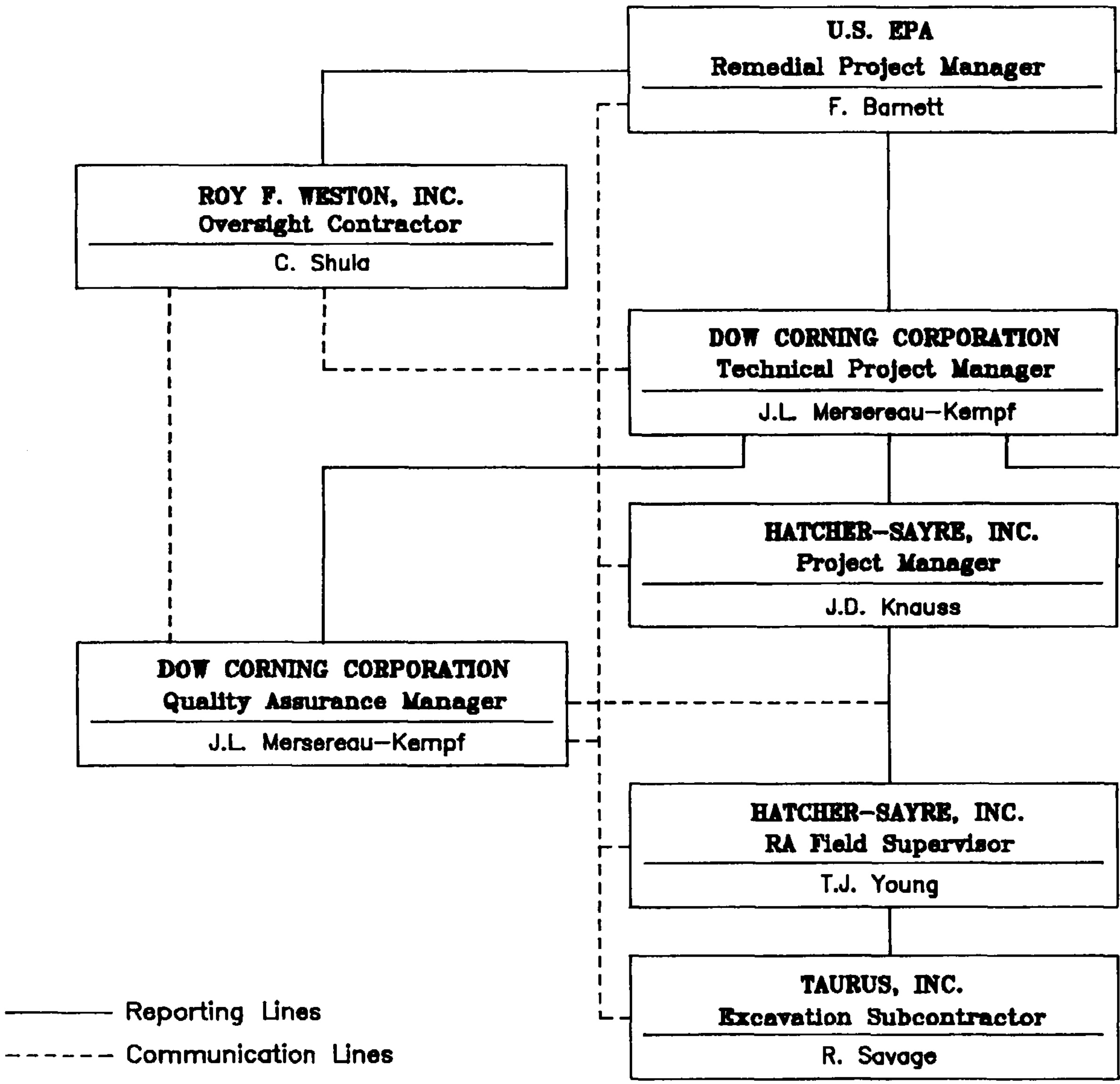
EPA, as the lead agency, will provide oversight on the project with the assistance of an Oversight Contractor. In its oversight role, EPA will ensure that the RD/RA activities are conducted in accordance with the ROD and Consent Decree in such a manner as to protect human health and the environment. As the support agency, the KNREPC Superfund Branch will assist EPA in project deliverable reviews and approvals.

Hatcher-Sayre, Inc. will provide technical and field management assistance to Dow Corning for the RD/RA phase of the project. This assistance will include the development of plans and schedules, collection of data, preparation of deliverables and management of the field activities in accordance with the plans and specifications.

Hatcher-Sayre's Project Manager will have responsibility for proper implementation of the plan on behalf of Dow Corning Corporation. The Project Manager will delegate on-site activities to Hatcher-Sayre's Field Supervisor. It will be the responsibility of the Field Supervisor to undertake the specific on-site activities described in the RA Plan. The RA Quality Assurance Manager will undertake inspections, review project documents and undertake additional sampling as required to ensure that QA procedures are being adhered to and that the remedy is in accordance with the plans and specifications.

The Field Supervisor will schedule pre-approved subcontractors and report to the Project Manager on a daily basis. Problems encountered on-site which may have the potential to change specific elements of the RA Plan will be communicated to the Project Manager as soon as they are identified. The Project Manager will, in turn, report these potential changes to Dow Corning and develop documentation for requesting any changes to the RA Plan. Any changes to the RA Plan must be approved in writing by EPA.

A RA Report will be submitted to EPA for review and approval at the conclusion of the RA, as indicated in Section 10.0, Project



DATE: 12/28/92	**FIGURE 15**	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	HOWE VALLEY PILOT STUDY ORGANIZATIONAL CHART	
APPROVED BY: JDK		CLIENT NO.: 0064-001

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Closeout. This report will certify that all items outlined in the ROD, Consent Decree (including the Scope of Work) and all approved plans, reports and documents have been completed. The report will also certify that the remedy is functional and operating and has met all performance standards and design specifications. The RA Report will be certified by a Professional Engineer registered in the Commonwealth of Kentucky.

6.0 COMMUNITY RELATIONS SUPPORT

At EPA's request, Dow Corning Corporation and Hatcher-Sayre, Inc. will assist EPA in preparing and disseminating information to the public regarding the RA work to be performed at the Howe Valley Landfill Site.

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7.0 CONSTRUCTION QUALITY ASSURANCE PLAN

The purpose of the Construction Quality Assurance (CQA) Plan is to ensure, with a reasonable degree of certainty, that a completed project meets or exceeds all design criteria, plans and specifications. The responsibilities and authorities of all of the organizations and key personnel involved in the RA are shown in Figure 15 and are further delineated in the Project Management Plan. As per EPA's suggestion, Jim Mersereau-Kempf of Dow Corning will serve as the Project Quality Assurance Manager.

To reduce errors resulting from poor communication, the CQA Plan will be discussed at the preconstruction meeting as well as the daily progress meetings. The information reviewed at these meetings will be as follows:

Preconstruction Meeting

- Provide each organization with all relevant CQA documents and supporting information
- Familiarize each organization with the site-specific CQA plan and its role relative to the design criteria, plans and specifications
- Establish any changes to the CQA plan that are needed to ensure that the Site will be remediated to meet or exceed the specified design
- Review the responsibilities of each organization
- Review lines of authority and communication for each organization
- Discuss the established procedures or protocol for observations and tests including sampling strategies
- Discuss the established procedures or protocol for handling construction deficiencies, repairs and retesting
- Review methods for documenting and reporting inspection data
- Review methods for distributing and storing documents and reports
- Review work area security and safety protocol

Daily Progress Meetings

- Review the previous day's activities and accomplishments
- Review the work location and activities for the day

- Identify the contractor's personnel and equipment assignments for the day

- Discuss any potential construction problems

Construction monitoring procedures, sampling activities and analyses indicating the type, frequency and acceptance criteria are shown in the FSAP. Duplicates will be taken of 10% of the samples under the Quality Assurance Manager's direction and submitted to International Technology Corporation in Export, Pennsylvania for the same analyses as indicated in the FSAP. Field and/or trip blanks will be periodically sent with the duplicate samples to further enhance the quality control. The Quality Assurance Manager will be on-site a minimum of once per week during the RA, monitoring the progress of the CQA Plan. If problems are identified in the field, the RA Field Supervisor will contact the Quality Assurance Manager to review possible corrective measures. If deviations from the plans and specifications occur, work will be halted until, in the opinion of the Quality Assurance Manager, compliance with the intent of the plans and specifications has again been achieved. Since the time frame for remediation of the organic material is relatively short, the reporting requirements will be kept to a minimum and will consist of daily reports, inspection data sheets, problem/corrective action reports and photographic data sheets. The information contained in each of these reports is shown below:

<u>Daily Reports</u>

- Date, project name, location and other identification

- Data on weather conditions

- Reports on any meetings held and their results

- Daily log of personnel entering the Site

- Unit processes and locations of construction under way during the time frame of the daily summary report

- Equipment and personnel being worked in each unit process, including subcontractors

- Calibrations or recalibrations of test equipment, including actions taken as a result of recalibration

- Decisions made regarding approval of units of material or of work, and/or corrective actions to be taken in instances of substandard quality along with documentation substantiating the decision

- Signature of appropriate CQA personnel

Inspection Data

- Description or title of the inspection activity
- Location of the inspection activity or location from which the sample increment was obtained
- Type of inspection activity; procedure used
- Recorded observation or test data, with all necessary calculations
- Results of the inspection activity; comparison with specification requirements
- Personnel involved in the inspection activity
- Signature of the appropriate CQA inspection personnel and concurrence by the CQA officer

Problem/Corrective Action Reports

- Detailed description of the problem
- Location of the problem
- Probable cause
- How and when the problem was located
- Estimation of how long problem has existed
- Suggested corrective measure
- Documentation of correction
- Final results
- Suggested methods to prevent similar problems
- Signature of the appropriate CQA inspection personnel and concurrence by the CQA officer

Photographic Data Sheet

- The date, time, orientation and location where the photograph was taken and weather conditions
- Location and description of the work
- The purpose of the photograph
- Signature of the photographer and concurrence of the CQA officer

If deemed appropriate by the CQA officer, the items above may be formulated into site-specific checklists and data sheets so that details are not overlooked. At the completion of the RA, a CQA project summary will be submitted to EPA which will include all of the CQA documentation during the RA, deviations from the plans and specifications and as-built drawings. This document will be certified correct by the signatures of the Site owner, design engineer, CQA officer and remedial contractor, as confirmation that each party understood and performed their function in accordance with the CQA plan. All records regarding the field activities, as well as communication between Dow Corning and all the parties involved with the RA, will be kept on file at the following locations:

Hatcher-Sayre, Inc.
3150 Custer Drive, Suite 301
Lexington, KY. 40517

Dow Corning Corporation
3901 South Saginaw
Midland, MI. 48686-0995

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8.0 ORGANIC PHASE OPERATIONS PLAN

The remedial action required to remove the organic contaminants will consist of excavating the affected area and aerating the soil to volatilize the VOCs. Once volatilization has brought the VOC levels below the SAL, the soil will be stockpiled until the aeration of all trenches is complete. The stockpiled material will then be replaced in the trenched area. The RA is more fully described in Section 3.1.3. All earth-moving and aeration procedures will be performed by Taurus, Inc. under the supervision of Mr. Raymond Savage. Mr. Savage, formerly of Clay Corman Excavating, has been equipment operator on over 20 Superfund sites. He has successfully completed the 40-Hour Hazardous Waste Site Worker and 8-Hour Hazardous Waste Site Supervisor training courses and has experience on over 30 Superfund sites as well as numerous emergency response cleanups.

Since all remedial activities will be on-site, there will be no need for any off-site transport of waste other than what is necessary to dispose of refuse generated during the RA. After completion of the RA, refuse will be disposed at a properly equipped landfill.

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9.0 CONTINGENCY PLAN

The objective of a Contingency Plan is to develop a prepared response to protect the local affected population in the event of an accident or emergency. With regard to the Organic Design Plan, the Field Supervisor is the individual who will be notified in the event of any emergency. Management for each subcontractor will be notified to contact the Field Supervisor in the event of an emergency.

9.1 STATE/LOCAL COMMUNITY NOTIFICATIONS

The Kentucky Division of Waste Management Superfund Branch, the Hardin County Judge Executive and the Hardin County Sheriff will be notified of site activity at least a day before personnel and equipment are mobilized to the Howe Valley Landfill. Additionally, Hardin Memorial Hospital will be notified of site activity and the emergency department of Hardin Memorial Hospital will be provided with a copy of the HASP.

9.2 AIR MONITORING

Air monitoring will be conducted adjacent to all work areas using a PID or FID and LEL meter. All work areas will be monitored during the excavation and aeration of the contaminated soils. Measurements will be periodically taken in the breathing zones of personnel and immediately upwind and downwind of the work areas. If the PID/FID meter indicates the presence of volatile organics in excess of the protection limit of an air purifying respirator in the work areas, relative to isobutylene (or methane, if the FID is utilized), then personnel protective measures will be upgraded from Level C to Level B. Additionally, if dust is visible as a result of the remedial activities, personnel protective measures will be upgraded and engineering controls will be implemented (i.e., moistening the excavation with water-mist) to ensure that fugitive particulates do not leave the Site. A wind sock will be provided on-site to establish the local prevailing wind.

9.3 SPILL CONTROL AND COUNTERMEASURES

In the event of on-site contaminated soil spillage beyond the limits of the design specifications, the soil will be removed to the stockpile area. Additionally, 4 to 6 inches of soil below the surface of the impacted soil area will be removed with the spillage. If organic vapors are encountered while excavating, a PID/FID will be used to establish the level of personnel protection during spillage cleanup. Spills will be minimized by placing the excavated soils on plastic and covering the stockpiles with plastic while awaiting analytical results.

10.0 PROJECT CLOSEOUT

Upon completion of the final grading and revegetation of both the inorganically and organically-contaminated areas, measures will be continued by Dow Corning to ensure that the RA was completed in accordance with all remedial design documents. At a minimum, this will include a Prefinal Inspection, Final Inspection and RA Report as delineated below.

10.1 PREFINAL INSPECTION

Upon preliminary project completion, which will consist of final grading and revegetation, Dow Corning will notify EPA for the purpose of conducting a Prefinal Inspection. Potential participants will include Hatcher-Sayre, Inc., Taurus, Inc., USEPA Region IV, Kentucky Division of Waste Management and a Hardin County representative. The Prefinal Inspection will consist of a walk-through inspection of the entire project site. The objective of the inspection will be to establish whether the project is complete and consistent with the Consent Decree. Any outstanding construction items discovered during the inspection will be identified and noted on a punch list. Retesting will be completed where deficiencies are revealed. A Prefinal Inspection Report will be submitted which outlines the outstanding construction items, actions required to resolve the items, completion date for the items and an anticipated date for the Final Inspection.

10.2 FINAL INSPECTION

Upon completion of all outstanding construction items, Dow Corning will notify EPA for the purpose of conducting a Final Inspection. The Final Inspection will consist of a walk-through inspection of the entire project site. The Final Inspection will use the Prefinal Inspection Report as a checklist, focusing on the outstanding construction items identified in it. All tests that were originally unsatisfactory will be conducted again. Confirmation will be made during the Final Inspection that all outstanding items have been resolved. Any outstanding construction items discovered during the inspection still requiring correction will be identified and noted on a punch list. If any items are still unresolved, the inspection will be considered to be a Prefinal Inspection requiring another Prefinal Inspection Report and subsequent Final Inspection.

10.3 REMEDIAL ACTION REPORT

Within thirty days after the Final Inspection, Dow Corning will prepare and submit a RA Report which certifies that all items contained in the Consent Decree, including the ROD and this Work

Plan and all incorporated documents (i.e., reports, plans and specifications, etc.) have been completed and that the remedy is functional and operating and has met the specifications. This report will be certified by a Professional Engineer registered in the Commonwealth of Kentucky. The RA Report shall include the following items:

- Brief summary of all events, problems and activities that occurred on-site;
- Brief description of how outstanding items noted in the Prefinal Inspection were resolved;
- Synopsis of the work defined in the Work Plan and certification that this work was performed;
- Explanation of modifications made during the RA to the original RD and RA Work Plans and why these changes were made;
- As-built and Record Drawings; and
- Documentation of how the Respondents are implementing the EPA-approved Operation and Maintenance Plan and Cleanup Goal Verification Plan.

After EPA review, Dow Corning will address any comments and submit a revised report. The RA will not be considered complete until EPA approves the RA Report.

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ADDENDUM

Air Concentrations vs Soil/Water Concentrations

The following discussion is provided to explain the higher air concentrations when screening with FID or PID meters. PCE has a vapor pressure of 14 mm Hg or 0.0184 ATM. Utilizing PCE's vapor pressure and Henry's Law Constant of 28.7 x 10^{-3} ATM m^3 $mole^{-1}$, at equilibrium, water would contain about 106 mg/L of PCE. With a Kd value of >20 L/kg, PCE in soil would be estimated at about 3,200 mg/kg (using an assumed Kd of 30 L/kg). PCE's vapor density is 5.83 g/L and, at 1.84% or 0.0184 ATM, there would be 18.4 liters of PCE per cubic meter or 107.3 g/m^3 in the air. This equates to approximately 15,800 ppm. A relative response on the FID or PID of 70% or 90% would produce a reading of about 11,000 ppm or 14,200 ppm. These results indicate that the air readings would be about 3.4 to 4.4 times higher than the soil concentration. To meet the SAL of 7.5 ppm, therefore, the respective meter readings should be about 26 ppm and 33 ppm. Under nonideal conditions, we have used a 10 ppm meter reading as an indicator of the 7.5 ppm SAL for PCE in soil. In any event, the soil concentration will be delineated through laboratory analyses to confirm if the concentration is below the SAL.

Although the FID and PID meters are calibrated differently, their relative responses indicate that at the level of concern (approximately 10 ppm), there will only be about a 2-3 ppm difference between the meter readings. This is well within the acceptable range of error.

APPENDIX A

FINAL
ORGANIC DESIGN PLAN
FIELD SAMPLING AND ANALYSIS PLAN

HOWE VALLEY LANDFILL
HARDIN COUNTY, KENTUCKY

Prepared by:

HATCHER-SAYRE, INC.
Lexington, Kentucky
January 22, 1993

Job No. 0064-001

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1.0 INTRODUCTION

1.1 OBJECTIVES

The Field Sampling and Analysis Plan (FSAP) defines the sampling and data-gathering methods that will be used for the project. It includes sampling objectives, sample location (horizontal and vertical) and frequency, sampling equipment and procedures, and sample handling and analysis. The Quality Assurance Project Plan (QAPP) describes the project objectives and organization, functional activities, and Quality Assurance/Quality Control (QA/QC) protocols that will be used to achieve the desired Data Quality Objectives (DQOs). These procedures are to be consistent with the USEPA Region IV's Standard Operating Procedures and Quality Assurance Manual, February 1, 1991 (SOP). Any modifications or changes to the established procedures are to be approved by EPA.

1.2 DATA REQUIRED TO SUPPORT THE REMEDIAL ACTION ACTIVITIES

The purpose of the Remedial Action (RA) is to implement the remedy selected in the Record of Decision (ROD) and confirm that the work was completed within the required performance criteria. The organic soil contamination remaining on-site is near the central portion of the Site (Figure 1). This area has essentially been defined to within ±35 feet. During the on-site treatment activities, samples will be collected to confirm that the soil action levels and cleanup criteria have been achieved.

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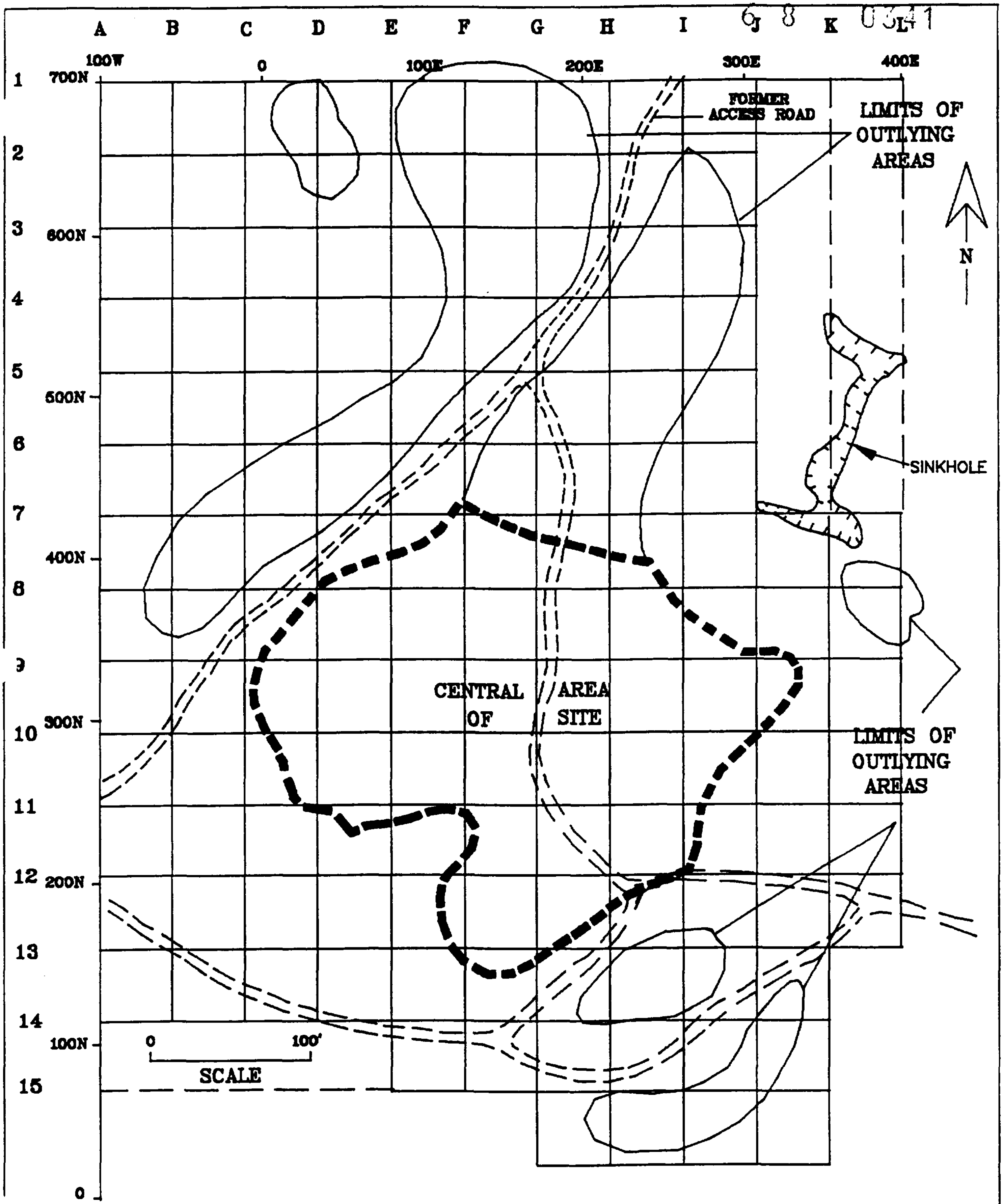

DATE: 8/14/92	FIGURE 1	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	AREA OF ORGANIC CONTAMINATION	
APPROVED BY: MAL		CLIENT NO.: 0064-001

0064-22

2.0 FIELD SAMPLING AND ANALYSIS PLAN

2.1 OBJECTIVES

This FSAP for the Site identifies the sampling and analytical objectives and provides detailed sampling and QA/QC procedures for sample collection, handling and shipping. The specific objectives for the collection of representative samples are:

- To ensure that the sample taken is truly representative of the material or medium being sampled;
- To use proper sampling, sample handling, preservation and QC techniques;
- To properly identify the collected samples and document their collection in permanent field records;
- To utilize sample chain-of-custody; and
- To protect the collected samples by properly packing and transporting (shipping) them to a laboratory for analysis.

2.2 REMEDIAL ACTION FIELD INVESTIGATIONS

The RA field investigations for soil will be separated into two distinct phases. The initial phase will consist of sampling and analysis to monitor the progress of the treatment (field screening). The second phase will consist of sampling and analysis to confirm or verify that the treatment has met the appropriate treatment levels (confirmation sampling).

In addition to soil, water from the retention ponds will also be analyzed to establish if organics are leaching from the soil and could potentially travel off-site. Air will be monitored at the work areas and site boundaries to ensure that organics are not migrating toward downwind property owners.

Also, the soil contaminated by the organic liquid will be sampled and investigated as delineated in the previously submitted "Final Organic Liquid Investigation Work Plan" dated January 12, 1993. The following sections will provide detailed descriptions of the procedures and protocols for field sampling and analysis required to perform the field investigation activities. USEPA's SOP has been utilized, where appropriate.

2.3 SOIL SAMPLING

Soil will be sampled and analyzed during the three stages of the RA (trenching, aeration and stockpiling) to ensure that the cleanup goals are obtained. Sampling at each stage is broken down into two categories which are further delineated below.

Stainless steel tubes or hand augers will be utilized to collect soil samples in the karst depressions to establish the vertical and horizontal extent of contamination from the organic liquid. The samples will be field-screened with PID or FID meters and confirmation samples submitted to Wadsworth/Alert Laboratories for PCE analysis.

2.3.1 Field Screening

2.3.1.1 Objective

The objective of the field screening task is to monitor the progress of the treatment so that the completion or the appropriate end of treatment can be identified.

2.3.1.2 Equipment

The following equipment will be utilized in undertaking the field screening task: decontaminated, stainless steel augers, trawls, spoons, pans, bowls, glass containers and calibrated PID and FID meters.

2.3.1.3 Field Screening Techniques

The field screening will take place in the areas designated for trenching and aeration. The contaminated soil will be brought to the aeration area and placed in 6- to 9-inch lifts. This soil will be rototilled to expose it to sunlight and air so that volatilization will occur.

At least twice a day, soil samples will be collected from the aeration areas and screened for total volatile organic compounds (VOCs). At these times, samples on approximately 50-foot centers will be collected for headspace analysis. The samples will be collected throughout the treated soil column with a decontaminated, stainless steel trawl, scoop or spoon and placed into quart jars so that they are approximately two-thirds full. The jars will be covered with aluminum foil, sealed and stored in a constant temperature environment. After a specified time period (normally 15 to 30 minutes) to allow for equilibration of any volatile organics, the PID or FID meter probe will be inserted through the foil into the headspace of the jar and meter readings recorded. If the samples have meter readings averaging above 10 ppm, the soil will be re-aerated and resampled until the meter readings of the treated soil average consistently below 10 ppm.

In similar fashion, the bottom of each trench excavation will be monitored with a PID or FID meter. If the soil VOC readings average consistently below 10 ppm, a sample will be taken from the floor of the excavation at about 50-foot intervals and analyzed off-site by an approved Contract Lab Program (CLP) laboratory for the target VOCs to confirm concentrations.

2.3.2 Confirmation Sampling

2.3.2.1 Objective

The objective of the confirmation sampling program is to verify that the treatment has reduced the volatile contaminants to acceptable levels.

2.3.2.2 Equipment

The following equipment will be used to collect the soil for confirmation analyses: decontaminated, stainless steel augers, trawls, spoon, scoops, pans, bowls and precleaned sampling containers.

2.3.2.3 Confirmation Sampling Techniques

Confirmation sampling and analysis will be implemented once the field-screened samples indicate that the VOC concentrations in the soil is below the SAL. Sampling will occur on 50-foot centers. The soil samples will be placed in precleaned glass containers with Teflon-lined caps so that essentially no headspace will occur. Each jar will be labeled, placed in a sealable plastic bag, packed into an ice cooler and shipped to the laboratory by overnight mail under chain-of-custody. The laboratory will analyze the samples for the chemicals of concern: 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), 1,1-dichloroethane (1,1-DCA) and 1,2-dichloroethene (1,2-DCE).

2.3.2.4 Special Precautions For Trace Contaminant Sampling

Some organic compounds can be detected in the parts per billion and/or parts per trillion range. Extreme care must be taken to prevent cross-contamination of these samples. The following precautions will be taken when trace contaminants are of concern:

- A clean pair of new, disposable gloves will be worn each time a different location is sampled and will be donned immediately prior to sampling.

- Sample containers for source samples or samples suspected of containing high concentrations of contaminants are to be placed in separate plastic bags immediately after collecting, preserving, tagging, etc.

- All samples are to be enclosed in plastic bags before placement in ice chests. Ice chests or shipping containers for source samples or samples suspected to contain high concentrations of contaminants will be lined with new, clean plastic bags.

- Sample collection activities will proceed from the least contaminated area to the most contaminated area (if this fact is known).

- Personnel will use equipment constructed of Teflon, stainless steel or glass that has been properly precleaned as outlined in Appendix B of USEPA's SOP for analyses.

2.3.2.5 Specific Sampling Equipment Quality Assurance Techniques

A logbook will be utilized for all major equipment so that all cleaning, maintenance and repair procedures can be traced to the person performing these procedures and to the specific repairs made. Sampling spoons, hand augers and other minor, disposable-type equipment are exempt from the equipment identification requirement.

All equipment used to collect soil samples will be precleaned or cleaned in the field, as outlined in Appendix B of USEPA's SOP, before each sampling. If cleaned in the field, all decontamination fluids will be containerized and properly disposed. The equipment will be cleaned and repaired, if necessary, before being stored at the conclusion of field studies. Any cleaning or repairs conducted in the field will be thoroughly documented in field records.

2.4 SURFACE WATER SAMPLING

As part of the remedial action phase, water samples will be collected from the on-site water treatment system and Boutwell Spring, the only known discharge location for water entering the on-site sinkhole. As soon as it can be arranged, samples will be collected from Boutwell Spring, split with EPA and analyzed for total VOCs. A second sample will be taken after the treatment system is up and operating. If no organics are detected in either sample, the spring will be sampled only after every significant rain event (1 inch or more) or on a quarterly basis during the on-site remedial activities. Should organics be detected in the initial sample, weekly samples will be collected until no organics are detected in two consecutive samples. At that time, monthly sampling would be implemented. Two consecutive, monthly, nondetect samples would signal a change to sampling after every significant rainfall or quarterly as discussed above.

The treated water discharge will be tested for volatile organics immediately after the system is operating. The flow rate will be monitored and when the volume reaches 75% of the projected breakthrough, daily samples will be collected and analyzed within 24 hours for VOCs to monitor breakthrough and recharge the system.

2.4.1 Water Sampling Equipment/Techniques

For collecting spring water samples, the sample container will be directly dipped into the spring water. A single grab sample will be taken at the center of the flowing water. The treated water discharge will be collected from the sampling port located immediately downstream from the activated carbon unit. The port will be opened (water collected and put into the 2,500-gallon container) to purge it. The port will be opened so as to not create turbulent flow. Collected samples will be analyzed for total VOCs. Containers and preservatives will be utilized as shown in Appendix A of USEPA's SOP.

Water samples that are to be analyzed for purgeable organic compounds will be stored in 40-ml septum vials with screw caps. To prevent contamination of the samples, the caps will be lined with Teflon-silicone disks. The disks will be placed in the caps (Teflon side to be in contact with the sample) in the laboratory prior to the beginning of the sampling program.

The 40-ml vials will be completely filled to prevent volatilization and extreme caution will be exercised when filling a vial to avoid any turbulence which could also produce volatilization. The sample will be carefully poured down the side of the vial to minimize turbulence. The last few drops will be gently poured into the vial so that surface tension holds the water in a sort of "convex meniscus". The cap will then be applied and some overflow lost, but air space in the vial will be eliminated. After capping, the vial will be turned over and tapped to check for bubbles; if any are present, the procedure will be repeated. Since the Volatile Organic Analytical (VOA) vials are prepreserved, extreme caution will be exercised when they are used as the collection device for surface samples in order to prevent the loss of the preservative. The recommended procedure is to not completely fill the vial and to use the vial cap to collect enough water to top off the sample.

When collecting water samples for purgeable organic compounds, duplicate samples will be collected from each location. Two 40-ml vials containing four drops of concentrated hydrochloric acid (HCl) will be filled with the sample and labeled PA (preserved acid).

2.4.2 Specific Sampling Equipment Quality Assurance Procedures

A bound, field logbook will be used to record daily activities, describe sampling locations and techniques, list photographs taken, document weather and pond conditions during the investigation, and record daily rainfall, water stage, etc. Visual observations are particularly significant in interpreting water quality study results and will also be recorded in field records.

All equipment used to collect water samples will be precleaned or cleaned in the field as outlined in Appendix B of USEPA's SOP before each sampling. If cleaned in the field, all decontamination fluids will be containerized and properly disposed. The equipment will be cleaned and repaired, if necessary, before being stored at the conclusion of field studies. Any cleaning or repairs conducted in the field will be thoroughly documented in field records.

2.5 AIR MONITORING

Monitoring of the ambient air at the Site is necessary to ensure the health and safety of those working at the Site as well as adjacent property owners. This monitoring will be conducted at all active work areas and at the upwind and downwind Site boundaries throughout the RA.

2.5.1 Air Monitoring Equipment/Techniques

The equipment to be used for air monitoring will consist of a HNu photo-ionizer, Model PI 101 (PID); Foxboro Century OVA, Model 128GC (FID); and an Industrial Scientific MX241 explosives (LEL) meter. The equipment will be inspected and calibrated in accordance with Appendix G of the USEPA Region IV SOP. The active work areas will be monitored continuously for VOCs (PID/FID) and combustible gases (LEL). Prior to monitoring, the meters will be cleaned of any visible evidence of dirt or moisture and adjusted to indicate a zero reading. In addition, all meters will be purged of gases from previous readings. The monitoring will be conducted in the breathing zones of the RA personnel.

A wind sock will be placed on-site to establish the prevailing wind direction so that monitoring with a PID/FID meter for VOCs can be conducted at the downwind boundary of the Site. Monitoring at the Site boundary will be conducted at least twice daily. Due to wind and/or weather conditions, the Field Supervisor may require that additional readings be taken. Equipment preparation for monitoring the Site boundary will be the same as described for the work areas. All meter readings will be recorded on a standardized form as shown on Figure 2.

2.5.2 Specific Monitoring Equipment Quality Assurance Procedures

A bound, field logbook will be used to record daily activities, describe monitoring locations and techniques, list photographs taken, document weather and wind conditions during the monitoring, etc. Observations of dust and odor can be particularly significant in interpreting air quality and will also be recorded in field records.

2.6 FIELD ANALYSES

2.6.1 General

QA procedures for field analysis and field analytical and test instrumentation calibration are an essential part of these standard operating procedures. All field analytical procedures will be conducted in duplicate at least 10 percent of the time. A record of these duplicate analyses will be kept in field logbooks. A significant difference in the replicate analyses (greater than specified in the following sections) will result in recalibration of the instruments used, re-examination of the analytical methodology being used, or re-examination of the sampling procedures and locations.

HATCHER-SAYRE, INC.
PID/FID Readings Form

Sheet ____ of ____

Project Name: ______________ Job Number: __________ Date: __________

Sample Location: ______________________ Distribution List:

Sampler: ______________ Sampler's Initials: __________

Reviewer: ______________ Reviewer's Initials: __________

Sample #	Time Sample Taken	Time Reading Taken	Meter Reading (Parts Per Million)	Comments

DATE: 8/17/92	FIGURE 2	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	PID/FID READINGS FORM	
APPROVED BY: JDK		CLIENT NO.: 0064-001

All field analyses must be traceable to the specific individual performing the analyses and to the specific equipment utilized. This information will be entered into the field logbooks for all field analyses. Time records will be kept in local time utilizing the military 2,400 hour format and will be recorded to the nearest 5 minutes.

A specific calibration and/or standardization plan for all field analytical equipment is presented in this subsection. Included in this plan are: calibration and maintenance intervals; listing of required calibration standards; environmental conditions requiring recalibration; and use of a logbook to record calibration and maintenance data for each piece of field analytical equipment.

2.6.2 Temperature

Initial Calibration - All thermometers will be initially calibrated against a National Bureau of Standards (NBS) certified thermometer or one traceable to NBS certification.

Inspection and Calibration - Each glass, mercury-filled thermometer will be inspected before each field trip to see that it is not cracked and does not have air spaces in the mercury column. If a mechanical, dial-type thermometer is used, it should not have a broken face cover or otherwise show damage. A cross-check with a calibrated NBS certified thermometer will be made at least semi-annually. Thermistors and electronic readout units will be calibrated in the same manner. Recording thermometers will be checked for recording accuracy before each use. The recorder time scale accuracy will be checked semi-annually. Before using a thermometer in the field, a visual observation will be made to assure that it has not been damaged. If a thermistor is used, the instrument will be checked against a thermometer before field use. Cross-checks and duplicate field analyses should agree to within $\pm$0.5 degrees C.

Calibration Records - A logbook will be maintained with each thermometer number and/or equipment property number recorded. All calibration information, names of individuals making the calibrations, and dates of calibration will be recorded. Each field calibration will be noted in the field logbook indicating the temperature readings observed.

Reporting Units - All temperature data will be reported to the nearest 0.5 degrees C.

2.6.3 pH

Equipment - Only electronic (portable) meters with provisions for temperature compensation will be used. Temperature-resistant combination electrodes will be used in conjunction with the meters. pH test paper will be used only for establishing pH ranges or approximate pH values.

Equipment Inspection And Calibration - The pH meter will be checked before each field trip for any mechanical or electrical failures, weak batteries and cracked or fouled electrodes. The slope of the meter will also be checked initially with three, fresh, standard buffer solutions (e.g., 4, 7 and 10). All pH recorders will be checked for recording and time scale accuracy. While in the field, the meter will be calibrated daily before use with two buffers bracketing the expected sample pH. Fresh buffer solutions will be used for each field trip. Prior to each sample collection or in case of an apparent pH violation, the electrode will be checked with pH 7.0 buffer and recalibrated to the closest reference buffer. The sample will then be retested. Duplicate analyses should agree to within 0.1 standard units.

Records - A logbook will be maintained and will contain the property number of each pH meter, all calibrations and repairs made, name of the person making repairs and calibration records.

Reporting Units - Report pH to the nearest 0.1 standard unit.

2.6.4 Specific Conductance

Equipment - A portable specific conductance meter, Wheatstone® bridge-type or equivalent will be used.

Inspection And Calibration - Each conductivity meter will be checked before every field trip. Batteries will be checked and conductivity cells will be cleaned and checked against known conductivity standards (KCl).

Field Calibration - The instrument will be checked daily with known standards before use in the field. Instrument instructions will be referred to for temperature conductance calculations. Duplicate field analyses should agree to within ±10 percent.

Calibration And Repair Records - A logbook will be maintained with all specific conductance meter equipment numbers. All repairs and calibrations will be noted. The logbook will include all calibrations and repair information along with the name of the person making the repair.

Reporting Units - Results will be expressed in micromhos/centimeter (umhos/cm) corrected to 25 degrees C. Results will be reported to the nearest ten units for readings under 1,000 umhos/cm and the nearest 100 units for readings over 1,000 umhos/cm.

2.6.5 Airborne Organics

Equipment - Direct reading PID, FID and LEL meters will be used in conjunction with monitoring VOCs and combustible gases as described in Section 2.5.1.

Inspection and Calibration - All meters will be checked prior to monitoring for any mechanical or electrical failures, weak batteries and cracked or fouled sampling probes. All meters will be calibrated and zero-adjusted each time they are used. Meter response and alarms will also be checked as deemed necessary by the operator. Prior to turning off the meter, a post-calibration check will be performed, although no adjustments will be made. Calibrations will be documented in a field logbook and will include the date, time, meter ID, battery/instrument response, fuel level (FID), calibration gas concentration and operator's name.

Reporting Units - Concentrations of VOCs will be recorded in parts per million (ppm) as compared to the calibration gas. Combustibility will be recorded as a percentage of the LEL.

2.7 SCHEDULE

Soil and air sampling activities described above will be initiated during on-site treatment activities. It will be continued, as needed, until the soil has been adequately treated. It is anticipated that this sampling will be undertaken during the late spring or early summer of 1993. The sampling of Boutwell Spring and water treatment effluent sampling will be initiated during January 1993 and continue throughout the remedial action phase. Monthly reports on the findings will be prepared and submitted to EPA for its review and approval.

3.0 QUALITY ASSURANCE PROJECT PLAN

Some of the QA/QC procedures were discussed in the previous sections. This section will detail additional QA procedures to be followed while conducting Site field sampling and analysis tasks. The QA/QC procedures that will be followed throughout the remedial action are shown in Section 7.0 - Construction Quality Assurance Plan of the Organic Design Plan.

3.1 DATA QUALITY OBJECTIVES

DQOs are established to ensure that the data collected are sufficient and of adequate quality for their intended uses. There are five DQO levels which provide varying levels of confidence in the analytical analyses. Level IV provides the greatest confidence for conventional analyses and utilizes low ppb detection limits by GC/MS, AA and ICP analyses. Since the data from the field sampling and analysis tasks will establish whether or not additional remediation is required at the Site, Level IV DQOs will be used for data analyses.

3.2 FIELD QUALITY CONTROL SAMPLES

QC samples generated for laboratory analyses during Site activities will include samples, trip blanks and field (or equipment) blanks. Additionally, 10 percent of the environmental samples will be collected in duplicate. All field QC samples will be collected and documented in the same manner as the field samples. EPA may split samples and provide blanks and spiked samples to monitor QA/QC procedures.

3.3 SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY

Each sample collected will have its own unique number, which will apply during the entire project. The sample number will consist of a specific alpha-numeric code, which will identify the sample.

Samples, other than in-situ field measurement or analysis, will be identified by using a standard sample label attached to the sample container (Figure 3). The following information is included on the sample label:

- Client name
- Job number
- Sample number and type
- Date and time of sample collection
- Sampler's signature
- Sample preservation
- Analyses to be performed
- Relevant comments

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HATCHER-SAYRE, INC.

905 Southlake Blvd., Richmond, VA 23236 (804) 794-0216 Fax: (804) 379-8934
3150 Custer Dr., Ste. 301, Lexington, KY 40517 (606) 271-0269 Fax: (606) 271-1204

Client: ____________ Job No: ____________

Sample I.D.: ________________________

Parameter: ________________________

Collected by: ____________ Preserved: ____________

Date Collected: ____________ Time: ____________

DATE: 7/31/91	FIGURE 3	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	STANDARD SAMPLE LABEL	
APPROVED BY: JDK		CLIENT NO.: 0064-001

All sample information will be recorded in bound logbooks and on the chain-of-custody record. The chain-of-custody record is depicted in Figure 4. All sample identification, field records and chain-of-custody records will be recorded in water-proof, non-erasable ink. Errors will be crossed out, corrected and dated by the investigator.

Chain-of-custody procedures include:

- To simplify the chain-of-custody record, as few people as possible should handle the sample during the investigation.
- The field investigator is responsible for proper handling and custody of the samples collected until they are properly and formally transferred to another person or facility.
- Sample labels (Figure 3) will be completed for each sample, using waterproof, nonerasable ink.
- All samples will be sealed immediately upon collection, utilizing custody seals. The field investigator will write the date and his/her signature on the seal. This requirement is waived if the field investigator keeps the samples in his/her continuous custody from the time of collection until they are delivered to the laboratory analyzing the samples.
- All samples must be documented in bound, field logbooks.
- A chain-of-custody record will be completed for all samples collected. A separate chain-of-custody record will be utilized for each final destination or laboratory utilized during the investigation.
- All sample sets will be accompanied by a chain-of-custody record. When transferring the possession of samples, the individual receiving the samples will sign, date and note the time that he/she received the samples on the chain-of-custody record. This chain-of-custody record documents transfer of custody of samples from the field investigator to another person or laboratory.
- Samples will be properly packaged for shipment and shipped or delivered to the designated laboratory for analyses. Shipping containers will be secured by using nylon strapping tape and custody seals. The custody seals will be placed on the container so that it cannot be opened without breaking the seals. The seals will be signed and dated by the field investigator.
- All samples will be accompanied by the chain-of-custody record. The original and one copy of the record will be placed in a plastic bag inside the secured shipping container, if the samples are shipped. One copy of the record will be retained by the field investigator or project leader. The original record will be transmitted to the field investigator

HATCHER–SAYRE, INC.

CHAIN OF CUSTODY RECORD

PROJECT	
PROJECT NO.	
SAMPLER'S SIGNATURE	
PRINTED NAME	

HATCHER–SAYRE, INC. SAMPLE NO.	DATE	TIME	MATRIX	NUMBER OF CONTAINERS	SAMPLE TYPE (CHECK BOX) GRAB	COMPOSITE	ANALYSES REQUIRED										REMARKS OR SAMPLE LOCATION	PRESERVATION ICED	SPECIFY CHEMICALS

RELINQUISHED BY (SIGNATURE):	DATE	TIME	RELINQUISHED TO (SIGNATURE):	SHIPPING COMPANY	SHIPPING TICKET NO.
RELINQUISHED BY (SIGNATURE):	DATE	TIME	RELINQUISHED TO (SIGNATURE):	REMARKS:	
RELINQUISHED BY (SIGNATURE):	DATE	TIME	RELINQUISHED TO (SIGNATURE):		
CONTRACT LAB	RECEIVED FOR LAB BY (SIGNATURE):	DATE	TIME	TURNAROUND REQUIRED ☐ 24 HOURS ☐ 48 HOURS	☐ NORMAL ☐ OTHER ______

DATE: 7/31/91	**FIGURE 4**	HATCHER–SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	CHAIN–OF–CUSTODY RECORD	
APPROVED BY: JDK		CLIENT NO.: 0064-001

or project leader after samples are accepted by the laboratory. This copy will become a part of the project file.

- If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, an airbill should be used. Receipts from post offices or airbills will be retained as part of the documentation of the chain-of-custody. The airbill number or registered mail serial number will be recorded in the remarks section of the chain-of-custody record.

3.4 SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS

Sample container, preservation and holding time requirements are specified in Appendix A of USEPA's SOP. Collected samples will be immediately placed in containers with ice to keep the samples cool. The ice and samples will be packaged separately to preserve the integrity of the samples. The samples, along with the chain-of-custody form, will be shipped to the laboratory by overnight air express.

3.5 SAMPLE PACKAGING AND SHIPPING

Samples will be packaged and shipped in accordance with procedures presented in Appendix C of the USEPA's SOP. The designated Site Operations Supervisor will ensure that the off-site laboratory is contacted in sufficient time to allow proper scheduling for rapid turnaround time on all analyses. For purposes of scheduling, the Site Operations Supervisor will track sample shipment, receipt, analyses and data validation and will be responsible for forwarding information to the appropriate recipients.

3.6 LABORATORY ANALYSES

Wadsworth/Alert Laboratories, Inc. in North Canton, Ohio will be utilized for conducting Level IV analyses (EPA No. 68-D10085 - expires 1/15/94). When samples arrive at the laboratory, they will be logged in, the chain-of-custody form signed, and the condition of the samples noted and recorded (i.e., any visible signs of tampering or damage). The laboratory will use USEPA methods (Table 1) and will follow USEPA's CLP procedures. As part of the QA/QC Program, duplicate samples, field blanks and trip blanks will be analyzed along with the other samples. Laboratory QA/QC procedures include using an extracted standard or spike as a quantitative check of the samples.

Hatcher-Sayre, Inc. will review the raw data and QA/QC samples to identify any inconsistencies. Laboratory verification of any apparent discrepancies will be required prior to submittal to USEPA.

6 8 0357

TABLE 1

ANALYTICAL METHODS AND DETECTION LIMITS

Parameter	Method	Detection Limits Water	Detection Limits Solids
1,1-Dichloroethane	SW846 8240	0.005 mg/L	1 mg/kg
1,2-Dichloroethene	SW846 8240	0.005 mg/L	1 mg/kg
Tetrachloroethene	SW846 8240	0.005 mg/L	1 mg/kg
1,1,1-Trichloroethane	SW846 8240	0.005 mg/L	1 mg/kg

3.7 DOCUMENTATION

Bound, weatherproof, field notebooks will be maintained by the field team. Team members will record all information related to sampling, weather conditions, unusual events, field measurements, etc. The pages in the field notebook will be numbered consecutively and each sampler will sign the field notebook for verification of the entries. The field notebooks will be kept in secured storage to maintain their integrity for future reference.

3.8 RESPONSIBILITIES

QA responsibilities of project personnel are as follows:

- Corporate QA Manager is responsible for the preparation and assessing the implementation of the QA Plan.
- Project Manager is the overall manager of technical and administrative activities and, as such, is responsible for overall Site quality assurance.
- Site Operations Supervisor will coordinate field activities and ensure that samples are taken and labeled in accordance with the FSAP and properly transferred to the appropriate laboratory.

APPENDIX B

FINAL
ORGANIC DESIGN PLAN
HEALTH AND SAFETY PLAN

HOWE VALLEY LANDFILL
HARDIN COUNTY, KENTUCKY

Prepared by:

HATCHER-SAYRE, INC.
Lexington, Kentucky
January 22, 1993

Job No. 0064-001

HEALTH AND SAFETY PLAN
Acknowledgement/Approval Sheet

This Health and Safety Plan has been prepared for Hatcher-Sayre, Inc. personnel. Site subcontractors are anticipated to have developed their own safety plans that meet or exceed this plan. The Site Health and Safety Officer will be responsible for securing a Site-Specific Health and Safety Plan from each subcontractor. Each individual working within the exclusion zone must acknowledge that they have read this document in its entirety by signing this acknowledgement/approval sheet.

Name/Date

6 8 0362

TABLE OF CONTENTS

6 8 0363

FIGURES

TABLES

SITE-SPECIFIC SAFETY PLAN

I. General Information

A. Project Name: Howe Valley Landfill
B. Location: Hardin County, Kentucky
C. Project Number: 0064-001
D. Client Name: Dow Corning Corporation

II. Project Organization

A. Project Manager: James D. Knauss
B. Corporate Health and Safety Supervisor: John E. Hanscom, Jr.
C. Operations Supervisor: Timothy J. Young
D. Site Health and Safety Officer: Timothy J. Young
E. Site Foreman: N/A
F. Client Representatives: Edward C. Ovsenik
James Mersereau-Kempf

III. Site Safety Plan Preparation

A. Prepared by and date: Maurice A. Lloyd 8/17/92
B. Reviewed by and date: Timothy J. Young 8/17/92
C. Amendments by and date: ______
D. Approved by and date: ______

Comments: The delineation of responsibility is further described in the Organic Design Plan (Section 5.0).

IV. Site History And Description

A. Type of Site: Spill ___ Hazardous Waste Site X
Transportation Accident ___ Other (specify) ___

B. Site Description: Former abandoned hazardous waste landfill consisting of approximately 11 acres of sparsely vegetated land located in Hardin County, south of Vertrees, Kentucky, 1.4 miles south of State Road 86 on an unmarked dirt road. Site lies at the boundary of the Constantine and Howe Valley USGS quadrangle maps at coordinates of 31°40'05" N latitude and 86°07'30" W longitude (Figure 1).

C. Previous Activities Performed On-Site: As a part of the RI Waste Characterization phase, all identified waste sources at the Howe Valley Site were removed, treated and/or disposed. These waste sources included containerized and non-containerized wastes as well as site safety gear, garbage, collected runoff water, etc. Soil areas known to contain inorganic contaminants (i.e., sludges) were removed and disposed with the sludge. Soils contaminated by volatile organic compounds were treated on-site by aeration.

D. Unusual Site Features or Physical Hazards: The landfill is situated in an enclosed basin in karst topography surrounded by ridges.

E. Results of Previous Surveys: Soil contains low levels of select organic and inorganic contaminants (see attached tables).

V. Safety And Health Risk Analyses

A. Waste Types: Liquid ___ Solid _X_ Sludge ___ Gas/Vapors ___

B. Hazardous Characteristics: Toxic _X_ Flammable/Volatile ___ Reactive ___ Radioactive ___ Corrosive ___ Ignitable ___ Biological Agent ___

C. Hazardous Materials (known or suspected):

Material	Quantity
1,2-dichloroethene	low
1,1,1-trichloroethane	low
1,1-dichloroethane	low
Tetrachloroethene	low

D.

Toxicity	PEL/TUB	Ceiling	IDLH
1,2-dichloroethene	200 ppm	--	4000 ppm
1,1,1-trichloroethane	350 ppm	--	--
1,1-dichloroethane	100 ppm	--	4000 ppm
Tetrachloroethene	100 ppm	200 ppm	--

E. Physical Hazards: Heat _X_ Cold ___ Noise ___ Radiation ___ Other (specify) _X_ (animal or insect bites and stings)

Comments: Due to the time of year of excavation, hot weather may be encountered. In the case of animal bites, American Red Cross First Aid will be administered and the victim will be transported to the hospital for observation by trained medical personnel if the skin has been broken. If the skin has not been broken, the victim will be observed by the Site Health and Safety Officer. In the case of insect bites or stings, a victim who demonstrates an allergic reaction will be transported to the hospital. Personnel with a history of allergic reactions to bites and/or stings should identify themselves to the Site Health and Safety Officer.

F. Weather: Late spring/early summer

G. Overall Hazard: Serious ___ Moderate ___ Low _X_ Unknown ___

VI. Site Organization And Control

A. Work areas identified: yes

B. Decontamination areas identified: For equipment

C. Support area established: yes

D. Site security established: yes

E. Entry and escape routes identified: yes

F. Sketch of Site available and attached: yes (Figures 2 and 3)

VII. Job Activities In Work Plan

A. Types of Activities Planned

1. Drum: Excavation ___ Sampling ___ Staging ___ Treatment ___ Disposal ___

2. Soil: Excavation yes Treatment yes Disposal ___

3. Water treatment: no

4. Spill cleanup: no

5. Well installation: no

6. Other (specify): ______________________

Comments: Remedial action activities are designed to excavate organic contamination and treat on-site by aeration.

VIII. Training

A. Site-Specific Training Required: yes

B. Type of Training: 40-hour OSHA Training - Supervisor additional 8 hours - updated annually.

C. Minimum Requirements

Site Health and Safety Officer:

1. OSHA 40-Hr Health and Safety Training
2. OSHA 8-Hr Hazwaste Site Supervisor Training
3. OSHA 8-Hr Refresher (current)
4. Certified CPR/First Aid Training
5. Prior Site Health and Safety Officer Experience on NPL Sites or Emergency Response

Site Personnel/ Certification Status	40-Hr	24-Hr	8-Hr Supervisor	8-Hr Refresher
Field Supervisor	x		x	x
Support Personnel	x		x	x
Equipment Operator		x		x
Transporter Personnel*		x		x

*Transporter personnel must also have completed commercial driver license requirements and their company's health and safety training.

IX. Medical Surveillance

A. Special Medical Monitoring Required: yes

B. Description: Site personnel on corporate medical monitoring program.

X. Ambient Air Monitoring

A. Specific Work Requirements: Continuous monitoring during excavation; periodic monitoring at downwind site boundary.

B. Equipment Requirements: PID, FID and LEL meters; the Direct Reading Calibration Records for these instruments are attached.

C. Changes in Level of Protection: Organics - if greater than 50 ppm total VOCs, change to Level C protection in areas where Level D is in effect; if visible dust is generated and engineering controls are not effective, work will be stopped until the dust level is controlled.

XI. Personnel Protection Requirements

A. Job Activity: Site excavation/aeration Level C*
*Upgraded if required

Personnel equipment required for Levels B, C and D:

Level B Protection

The use of Level B protection shall be required whenever any of the following criteria are met:

1. The hazardous material(s) has been identified and the highest level of respiratory protection is required, but a lower level of skin and eye protection may be used based upon:

a. Atmospheric concentration(s) of the material(s) is below the immediately dangerous to life and health concentration (IDLH), but above twice the threshold limit value (TLV).

b. Atmospheric concentration(s) of the material(s) is above the protection limit for a full-face, air-purifying respirator.

c. Atmosphere contains materials not amenable to removal by air-purifying cartridges or canisters.

d. Atmosphere contains materials which require the use of air-supplied respiratory protection, but the material or concentration does not pose a skin hazard.

2. The atmosphere is oxygen deficient (below 20% oxygen).

3. Entry into an unknown atmosphere is required before a hazard determination is made.

Level B equipment provides a high level of respiratory protection, but a reduced level of skin protection from Level A. As for any level of protection, the protective clothing should be matched with the substance it protects against. Level B skin protection for known or anticipated hazardous materials is based upon:

1. Comparison between the concentrations in air of known or identified material and its skin toxicity.

2. Determination of the presence of materials which are skin destructive or readily absorbed through the skin by splashes or high airborne concentrations.

3. Assessment of the effect the material has on exposed skin on the neck and head at its measured air concentration or splash potential.

Generally, for most site entries in an unconfined area, Level B protection with a hooded, chemical-resistant suit should provide adequate protection for the criteria of a Level B environment.

Level B personnel protective equipment includes the following:

1. Pressure-demand self-contained breathing apparatus (SCBA) [MSHA/NIOSH approved]
2. Hooded, one or two-piece chemical-resistant outer suit
3. Chemical-resistant outer gloves
4. Chemical-resistant inner gloves
5. Chemical-resistant outer boots with steel toe and shank
6. Hard hat
7. Two-way radio communications

Optional:

8. Chemical-resistant disposable outer boots
9 Chemical-resistant disposable outer suit
10. Coveralls
11. Face shield

Level C Protection

The use of Level C protection shall be required whenever all of the following criteria are met:

1. The airborne concentrations of identified materials can be reduced to or below the permissible exposure limit (PEL) and the concentrations do not exceed the specified limit of the air-purifying cartridge or canister.

2. The atmosphere is not an IDLH or oxygen deficient environment.

3. Airborne contaminants, liquid splashes or other direct contact will not adversely affect unprotected skin.

4. Hazard determination shows that a SCBA is not required.

5. The identified materials have an odor threshold below the PEL.

6. Total vapor readings do not exceed 5 ppm for unknown materials.

7. Periodic air monitoring will be performed.

8. The materials are identified.

9. The person has satisfactorily passed a qualitative respirator fit test.

With the exception of using an air-purifying respirator (APR), Level C protection is equivalent to Level B protection. This exception is permitted only upon satisfying all of the previously mentioned Level C criteria. It is imperative that continual air monitoring be conducted to detect any changes in air quality which would prohibit continued use of an APR. A direct reading instrument such as a PID or OVA shall be used.

Level C personnel protective equipment includes the following:

1. Full-face, half-face or air-purifying respirator equipped with MSHA/NIOSH approved cartridges or canisters
2. Hooded, one or two-piece chemical-resistant suit
3. Chemical-resistant outer gloves
4. Chemical-resistant inner gloves
5. Chemical-resistant outer boots with steel toe and shank (unless safety leather boots are worn underneath)
6. Hard hat (with face shield, if required)
7. Intrinsically safe two-way radio communications

Optional:

8. Coveralls
9. Escape mask

Level D Protection

The use of Level D protection shall be required whenever all of the following criteria are met:

1. The atmosphere contains no detectable levels of airborne hazardous contaminants.

2. The work assignment precludes the employee from potential exposure to splashes, immersion or inhalation of hazardous material.

Level D protection should be used only in areas where boots may become contaminated and there are no airborne inhalable contaminants.

Level D personnel protective equipment includes the following:

1. Coveralls
2. Chemical-resistant or leather shoes/boots with steel toe and shank
3. Hard hat

Optional:

4. Gloves
5. Chemical-resistant, disposable outer boots
6. Face shield
7. Emergency escape mask
8. Safety glasses or chemical goggles

XII. Safety Equipment List

A. First Aid: First aid kit

B. Fire Fighting: Fire extinguisher

C. Communications (radios/signs): Portable telephone

D. Personnel Protective Equipment: Levels C and D protection requirements (see above).

E. Decontamination Equipment: Equipment decontamination area set up on-site.

F. Sanitation: Latrines X Showers ___ Handwashing X

Comments: Soap and water for handwashing and portable toilets will be made available.

XIII. Decontamination Procedures

A. Personnel Decontamination Procedures

Work activities: Soil, water and sediment sampling.

Level of protection: C and D

Decontamination solutions: Soap and water.

Procedures: If skin comes into contact with contaminated soil or water, wash area with supplied soap and water.

B. Equipment Decontamination Procedures

1. All sampling equipment and utensils will be decontaminated using procedures recommended in the USEPA Region IV Standard Operating Procedures document (February 1991).

2. Larger pieces of equipment which come into contact with contaminants will have the portion impacted by the contact:

   a. Moistened with water-spray.

   b. Scraped of potentially-contaminated soil, which will then be placed onto plastic.

   c. Cleaned with a high-pressure steam cleaner.

3. All water used during equipment decontamination will be collected on plastic sheets in the bermed decontamination area and pumped into 55-gallon drums, if necessary. This water will then be sampled and analyzed to establish if maximum contaminant levels for drinking water have been exceeded. If so, the collected water will be treated using the on-site activated carbon unit and discharged into an existing holding pond.

C. Level B and C Decontamination Procedures

Station 1 - Equipment Drop: Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, a cool-down station may be set up within this area.

Station 2 - Outer Garment, Boots and Gloves Wash and Rinse: Scrub outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.

Station 3 - Outer Boot and Glove Removal: Remove outer boots and gloves. Deposit in container with plastic liner.

Station 4 - Canister, SCBA or Mask Change: If worker leaves exclusion zone to change canister, SCBA or mask, this is the last step in the decontamination procedure. Worker's equipment is exchanged, new outer gloves and boot covers donned, joints taped and worker returns to duty.

Station 5 - Boots, Gloves and Outer Garment Removal: Boots, chemical-resistant splash suit and inner gloves are removed and deposited in separate containers lined with plastic.

Station 6 - Face Piece Removal: Face piece is removed. Avoid touching face with fingers. Face piece is deposited on plastic sheet.

Station 7 - Field Wash: Hands and face are thoroughly washed. Shower as soon as possible.

XIV. Contingency Plans

A. Local Sources of Assistance

1. Emergency Services: 911

2. Hospital: Hardin Memorial Hospital; Elizabethtown, Kentucky, 502-737-1212

   Directions: Take Tom Duvall Lane to KY 86; turn right on KY 86 and follow to KY 62; turn left on KY 62 and follow to Fort Knox Bypass; take north entry ramp to Bypass; go to second red light; turn right on Saint John Road; go to first red light; turn left on 31W North; go approximately 1/2 mile; turn left into Hardin Memorial Hospital parking lot; follow signs to emergency room. Total trip encompasses approximately 15 miles.

   Travel route (map): See Figure 4.

3. Ambulance: Hardin County Ambulance Service, 502-769-3342

4. Elizabethtown City Fire Department: 502-765-2121

5. County Fire Department: Kentucky 86, 502-765-2900

6. Police: Kentucky State Police, 502-765-6118
   Hardin County Sheriff, 502-765-5133 (days)
   502-765-4125 (5pm-8am)

7. Disaster Emergency Service: 502-769-6367

8. Kentucky Regional Poison Control: 800-722-5725

9. Airport: Addington Field, Elizabethtown 501-769-5454

10. Site mobile phone number: 606-229-4349

B. National or Regional Sources of Assistance

1.	Hatcher Sayre, Inc. (Lexington, KY)	606-271-0269
2.	EPA (Emergency Response - Atlanta)	404-347-4062
3.	Chemtrec (24 hours)	800-424-9300
4.	Center for Disease Control (Biological Agents)	404-633-5313
5.	National Response Center, NRC (Oil/Hazardous Substances)	800-424-8802
6.	DOT, Office of Hazardous Materials Safety DOT, (Hazardous Materials Standards)	202-366-0656 202-366-4488

C. Air Monitoring Plan: On-site air monitoring will consist of continuous monitoring performed immediately adjacent to any waste excavation areas, treatment areas and any other applicable areas when work is occurring. Measurements will be taken in the breathing zones of personnel at the downwind site boundary and immediately upwind and downwind to the work areas. Equipment will include the following, at a minimum: PID or FID and LEL meter.

D. Special First Aid: N/A

E. Evacuation Procedures: N/A

XV. Amendments To Health And Safety Plan

A. This Health and Safety Plan is based upon information available at the time of preparation. Unexpected conditions may arise. It is important that personnel protective measures be thoroughly assessed prior to and during the planned activities. Unplanned activities and/or changes in the hazard status should initiate a review of and major changes in this plan.

B. Changes in the hazard status or unplanned activities are to be submitted on "Amendments to Site-Specific Health and Safety Plan" which is included on the following page.

C. Amendments must be approved by the plan author prior to implementation of amendment.

6 8 0375

Amendments to Site-Specific Health And Safety Plan

Changes in field activities or hazards: ______________________________

Proposed Amendment: ______________________________

Proposed by: ______________________ Date: __________

Approved by: ______________________

Accepted: __________ Declined: __________ Date: __________

Health and Safety Officer: ______________________

Amendment Numbers: ______________________

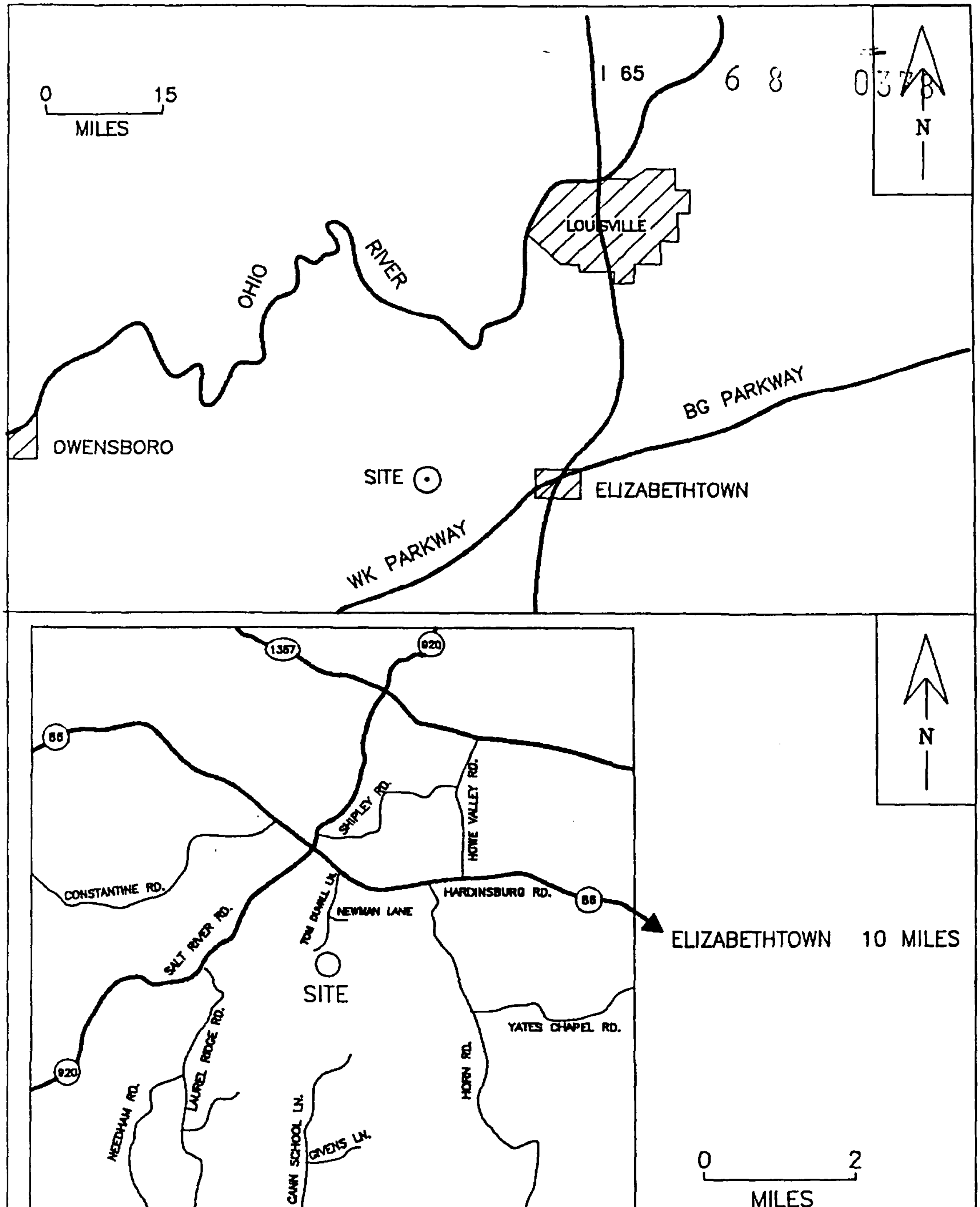
Amendment Effective Date: ______________________

SOIL ANALYSES - ORGANICS (mg/kg) - POST-REMOVAL SAMPLING

LOCATION	1,1-DCA	1,2-DCE	1,1,1-TCA	PCE	DETECTION LIMIT
2F Surface	ND	ND	0.013	0.180	0.005
2F Bottom(3')	ND	ND	ND	ND	0.010
3F Surface	ND	ND	0.015	0.028	0.005
3F Bottom(3')	ND	ND	ND	ND	0.005
7C Surface	ND	ND	ND	ND	0.005
7C Bottom(3')	ND	ND	ND	ND	0.005
8E Surface	ND	ND	5.8	80	3.4
8E 3'	ND	ND	66	400	31
8E Bottom(5.5')	ND	ND	5.1	66	5
8F.5 Surface	ND	ND	ND	0.503	0.3
8F.5 Bottom(3')	ND	ND	ND	92	10
8H Surface	ND	ND	ND	7	0.33
8H Bottom(2.5')	ND	ND	ND	ND	0.3
9.5C.5 Surface	ND	ND	ND	0.40	0.32
9.5C.5 3'	ND	ND	ND	ND	0.33
9.5C.5 Bottom(9')	ND	ND	200	800	10
9.5E Surface	ND	ND	ND	6	1
9.5E Bottom(3')	ND	0.62	2.7	25	0.63
9.5F.5 Surface	ND	ND	ND	ND	2
9.5F.5 3'	ND	ND	170	53	2
5F.5 Bottom(6.5')	ND	ND	ND	10	2
9.5H Surface	ND	ND	ND	ND	2
9.5H 3'	ND	ND	ND	ND	0.33
9.5H Bottom(7.5')	ND	ND	ND	0.55	0.33
9.5I.5 Surface	ND	ND	ND	ND	0.33
9.5I.5 3'	ND	ND	ND	ND	0.33
9.5I.5 Bottom(7.5')	ND	ND	ND	ND	0.33
11E Surface	ND	0.007	0.049	0.180	0.006
11E Bottom(3')	ND/ND	15/20	18/33	20/26	1.9/5.1
11F.5 Surface	ND	ND	0.370	1.40	0.35
11F.5 3'	ND/ND	ND/ND	ND/0.42	ND/0.48	0.33/0.32
11F.5 Bottom(8.5')	ND	ND	0.002	0.006	0.002
11H Surface	ND	ND	ND	ND	2
11H 3'	13	ND	340	38	9
11H Bottom(6')	ND	ND	3.4	3.8	3.2
12.5F.5 Surface	ND	ND	2.9	2.3	0.33
12.5F.5 3'	ND	0.073	0.099	0.044	0.02
12.5F.5 Bottom(9')	ND	ND	ND	ND	0.31
Site Geometric Mean(n=38)	0.15	0.18	0.40	0.88	
Near Surface(n=15)	0.10	0.10	0.21	0.62	
3 Ft Depth(n=15)	0.18	0.26	0.68	0.75	
5 to 9-Ft Depth(n=8)	0.31	0.31	0.79	1.90	

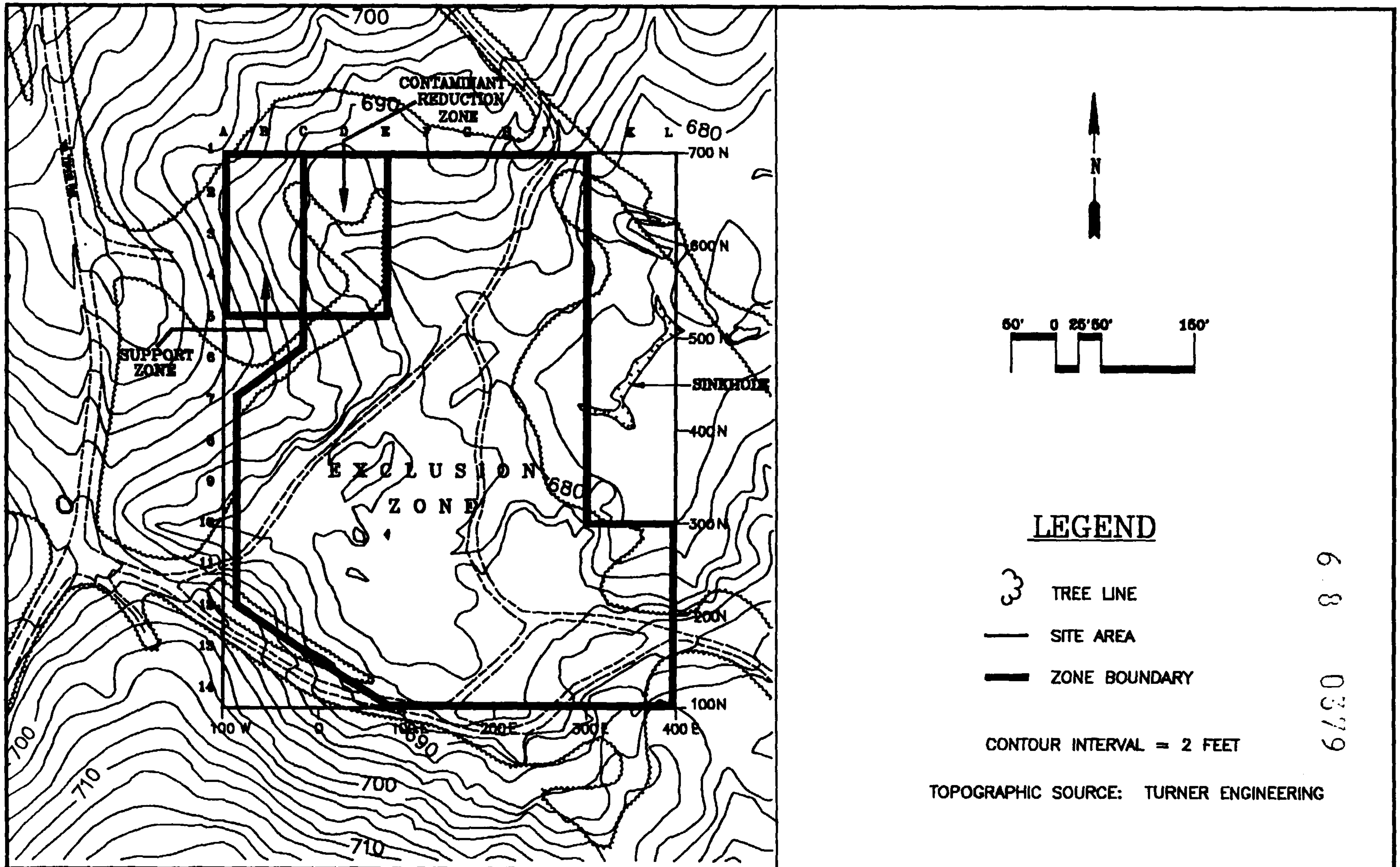
SOIL ANALYSES - INORGANICS (mg/kg) - POST-REMOVAL SAMPLING

LOCATION	CHROMIUM	COPPER	ZINC	CYANIDE
1F Surface	16	12	41	-
1F Bottom	19	7.8	34	-
1G Surface	46	13	76	-
1G Bottom	91	14	120	-
1.5D Surface	680/690	270/390	680/770	-
2D Surface	220	240	260	-
2F Surface	16	7.8	42	ND(0.5)
2F Bottom	16	14	74	ND(0.5)
2G Surface	350	42	360	-
2G Bottom	12	5.7	36	-
3F Surface	170	16	210	0.9
3F Bottom	27	14	131	ND(0.5)
3G Surface	16	9.6	38	-
3I Surface	11/19	17/27	33/45	-
4G Surface	61	12	76	-
4G Bottom	15	6.1	35	-
4I Surface	22	640	51	-
4I Bottom	130	130	130	-
5F Surface	81	21	94	-
5H Surface	34	20	51	-
5H Bottom	33	6.8	49	-
Surface	45	180	66	-
5I Bottom	91	8.7	89	-
6E Surface	34	12	62	-
6E Bottom	19/17	8/8.1	46/43	-
6H Surface	19	6.9	41	-
6H Bottom	18	6.6	38	-
7C Surface	110	5.4	110	3.6
7C Bottom	11	7	16	0.6
7D Surface	1700/1800	30/20	1800/2000	-
7D Bottom	140	8.5	120	-
8B Surface	55	7.8	65	-
8B Bottom	15	8	30	-
8L Surface	12	6.4	32	-
8L 3′	13	6.6	32	-
8L Bottom(6.5′)	19	7.2	43	-
9.5E Surface	33	13	55	0.7
9.5E 3′ (Bottom)	53	18	90	ND(0.5)
12.5F.5 5.5′	12	2.1	14	ND(0.5)
14J Surface	19	13	36	-
14J Bottom	18/17	11/9	31/28	-
15I Surface	20	12	52	-
15I Bottom	13	5.8	33	-
15J Surface	20	8.4	33	-
15J Bottom	15	11	31	-
Site Geometric Mean(n=45)	36.2	14.3	63.6	0.48(9)
ar Surface(n=24)	50.8	21.3	83.4	0.87(4)
-Ft Depth(n=19)	26.3	10.0	50.6	0.31(4)
5 to 6-Ft Depth(n=2)	15.1	3.9	24.5	0.25(1)



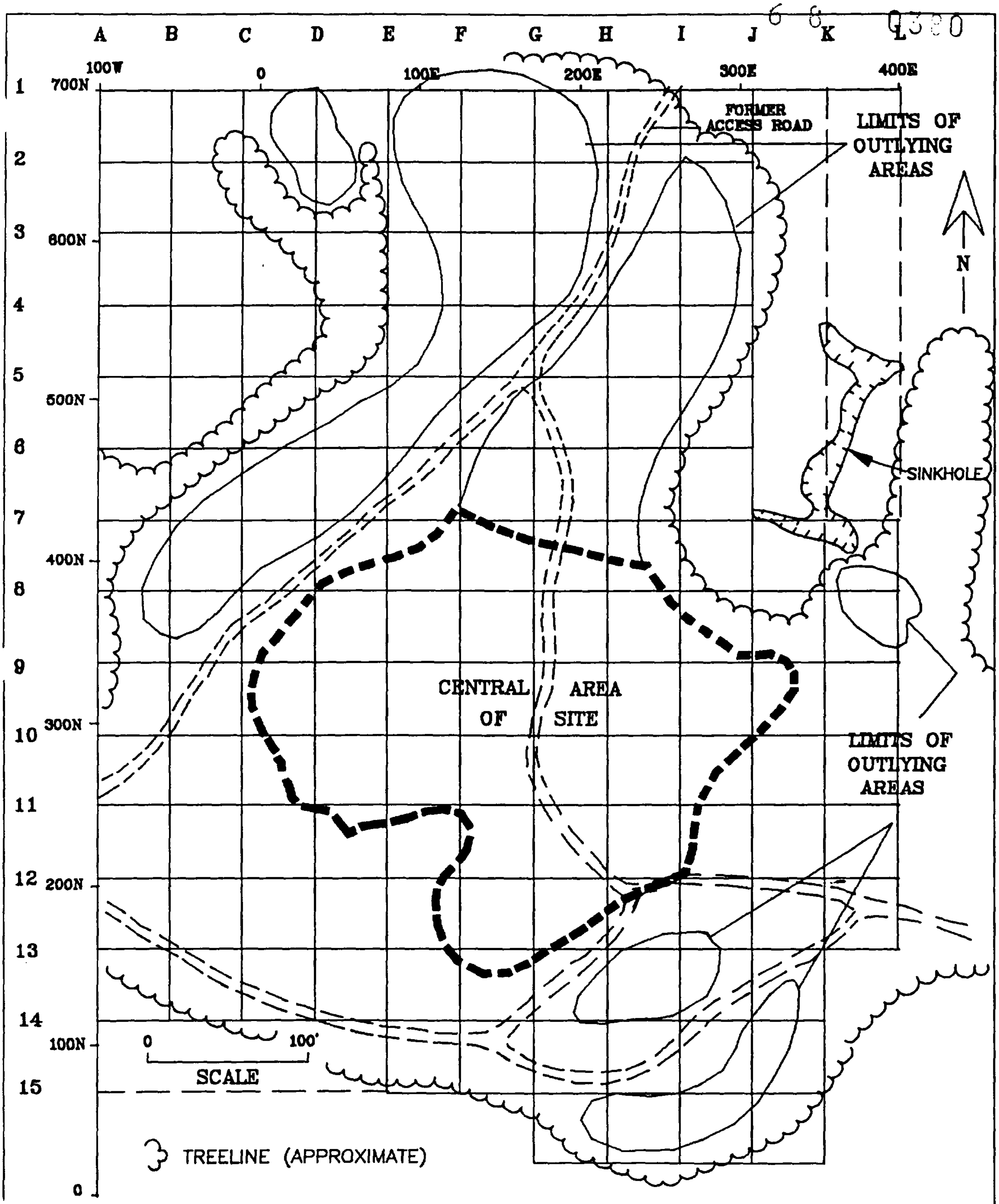
SOURCE: HARDIN CO. ROAD MAP

DATE: 7/29/91	FIGURE 1	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	LOCATION OF HOWE VALLEY LANDFILL	
APPROVED BY: TY		CLIENT NO.: 0064-001

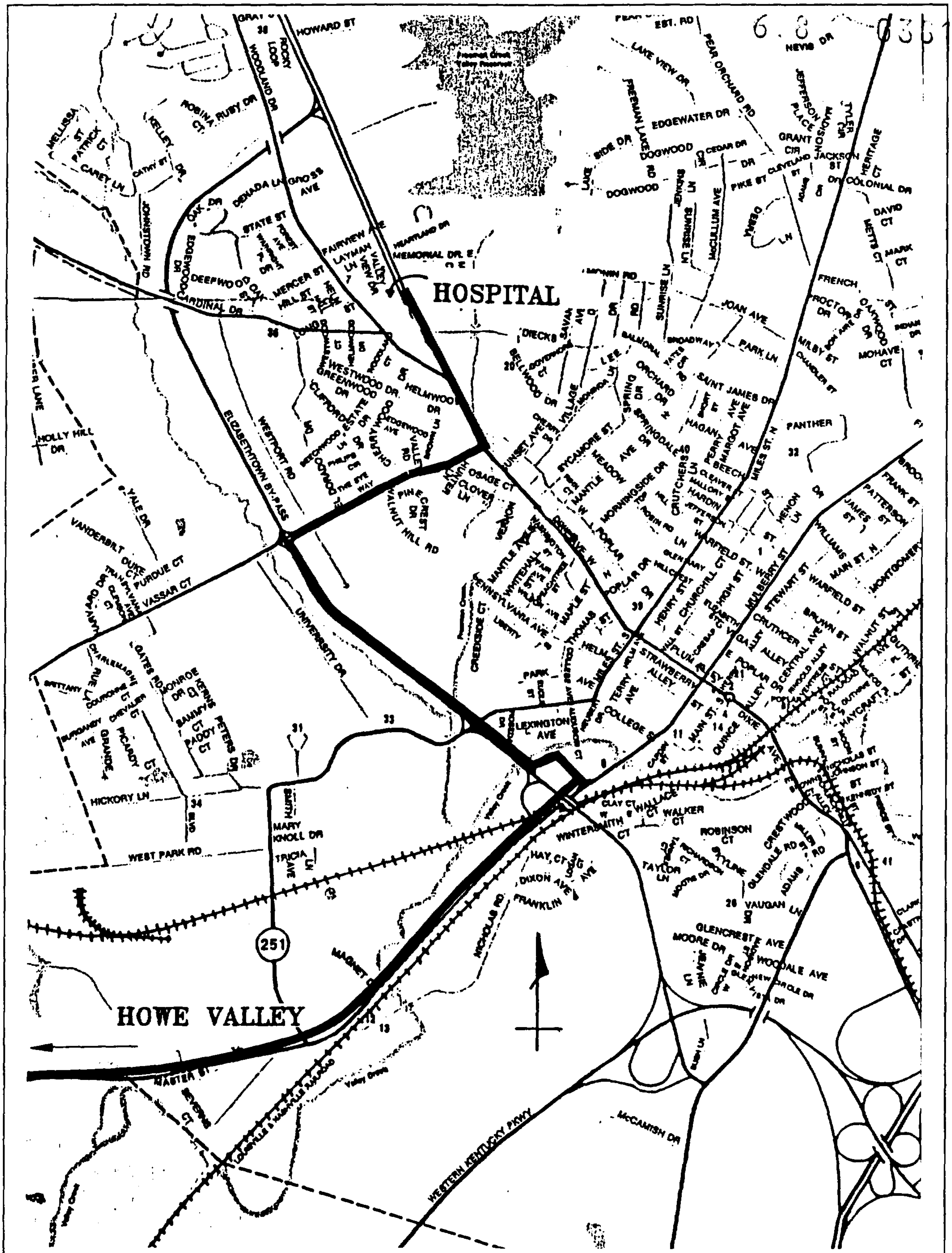


DATE: 3/18/92	FIGURE 2	HATCHER-SAYRE, INC. LEXINGTON, KENTUCKY
DRAWN BY: PDH	SITE FACILITY LAYOUT	
APPROVED BY: MAL		CLIENT NO.: 0064-001

6 8 0379



DATE: 7/29/91	FIGURE 3	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	CENTRAL AND OUTLYING DISPOSAL AREAS OF THE SITE	
APPROVED BY: JDK		CLIENT NO.: 0064-001



DATE: 7/30/91	FIGURE 4	HATCHER-SAYRE, INC.
DRAWN BY: PDH		LEXINGTON, KY
APPROVED BY: JDK	TRAVEL ROUTE TO HOSPITAL	CLIENT NO.: 0064-001

6 8 0382

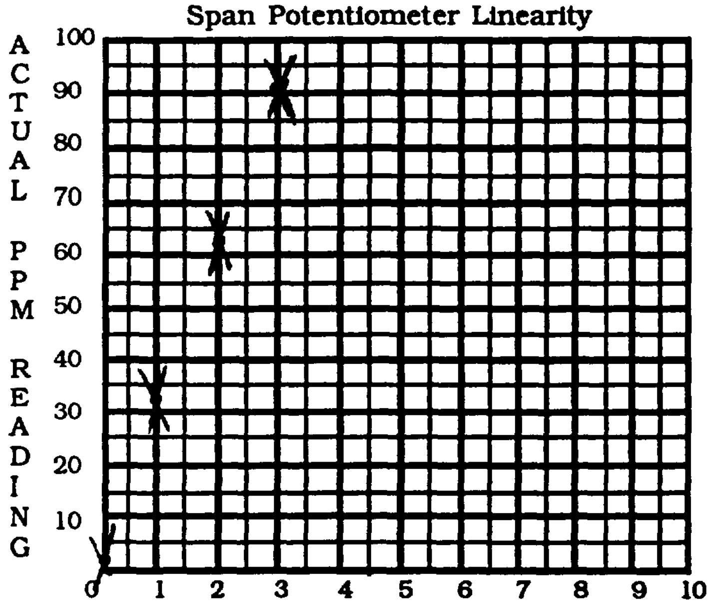
HAZCO Services, Inc.

Instrument Description OVA 128 GC

Mfg. Serial #: 51051 **Calibration Date:** 6/17/92

[redacted] **Serial #:** HATCHER-SAYRE **Technician:** JDR

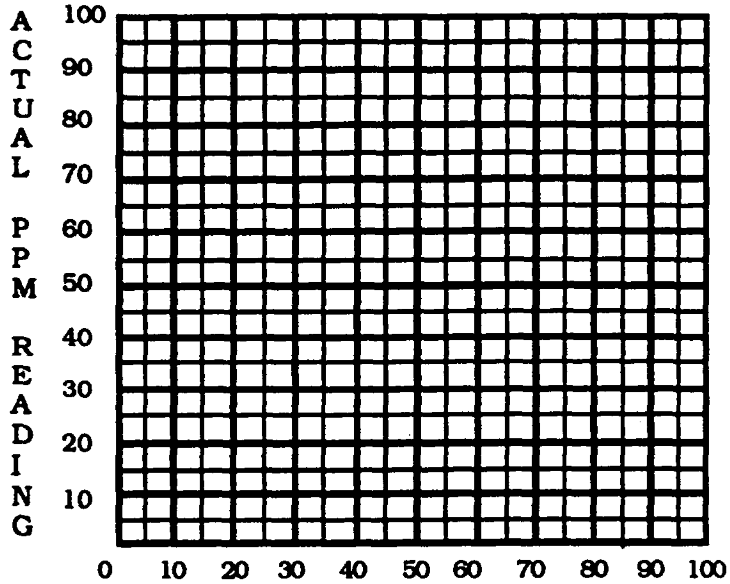
Span Potentiometer Linearity



Span Potential Setting

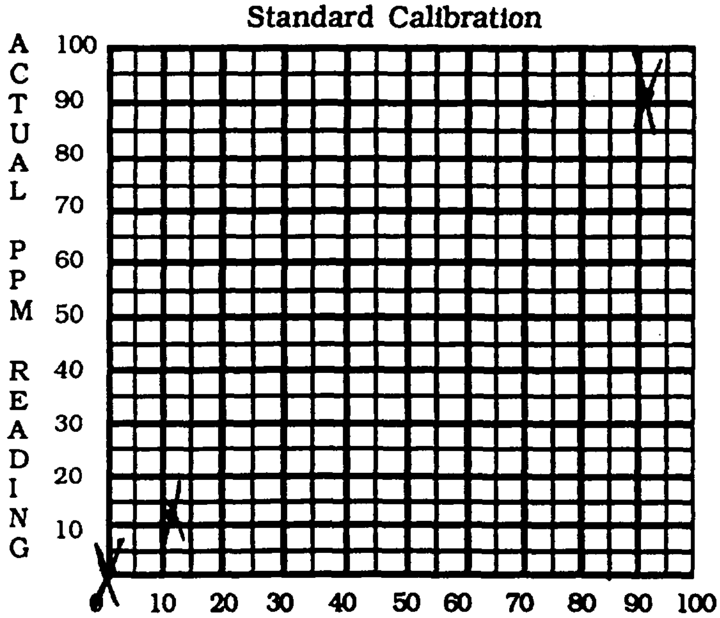
Calibration Points 3.0-91, 2.0-63, 1.0-32, 0-2

Standard Calibration



Calibration Points

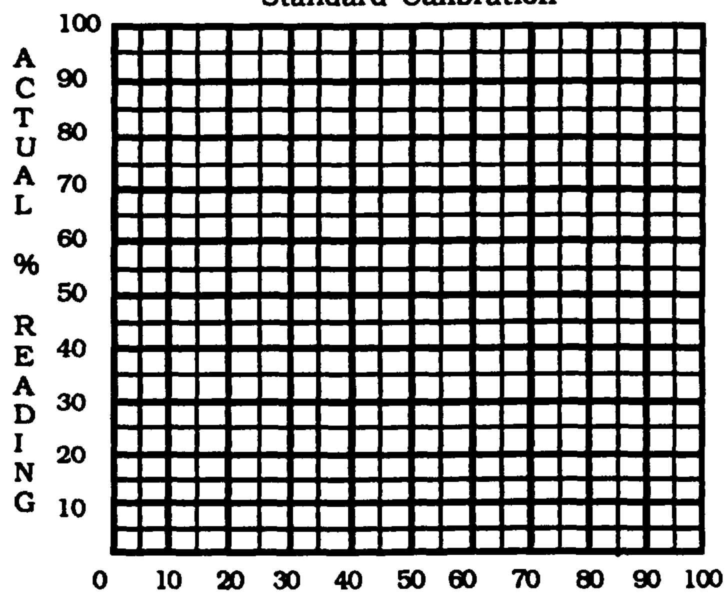
Standard Calibration



Calibration Gas Level (PPM)

Calibration Points 0-0, 10.8-11, 91-91, 192-190

Standard Calibration



Calibration Gas Level (%)

Calibration Points

Please Return Equipment To

- [x] HAZCO Services, Inc., 2006 Springboro West, Dayton, OH 45439, 513-293-2700
- [ ] HAZCO Services, Inc.,Windsor Industrial Park, Route 130, Building 12, Windsor, NJ 08561, 609-443-9350
- [ ] HAZCO Services, Inc., 15353 East Hinsdale Circle, Suite D, Englewood, CO 80112, 303-766-1501
- [ ] HAZCO Services, Inc., 1921 East Carnegie Ave, Building III, Suite O, Santa Ana, CA 92705, 714-263-1163

HNU MODEL 101 SPECIFICATION SHEET

Serial # 801388

Calibration Benzene By JG

Range: 0-20 0-200 0-2000

Span Pot Setting: 5.0

Light Source Energy: 9.5 eV ______ 10.2 eV ______ 11.7 eV MA 385

Reference Gas Data

Species	Concentration (ppm)	Span Pot Setting	Response (ppm)
Benzene	102.3	5.0	102

This PI-101 was calibrated with 100 ppm Isobutylene which is equivalent in response to 55 ppm Benzene at a span setting of 9.8

6 8 0384

APPENDIX C

6 8 0385

FINAL
ORGANIC DESIGN PLAN
TECHNICAL SPECIFICATIONS

HOWE VALLEY LANDFILL
HARDIN COUNTY, KENTUCKY

Prepared by:

HATCHER-SAYRE, INC.
Lexington, Kentucky

January 22, 1993

Job No. 0064-001

6 8 0386

TABLE OF CONTENTS

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1.0 EARTHWORK

1.1 SCOPE

This work will consist of the required excavation, aeration and proper placement of all materials and the shaping and finishing of the contaminant area to smooth, gentle slopes as indicated herein or as directed by the Remedial Action (RA) Field Supervisor.

1.2 GENERAL

Earthwork will include excavation to the designated depth, the transporting of excavated materials from points of removal to points of treatment and final placement and the shaping and finishing of all areas to smooth, gentle slopes. The term material, as used in this section of the specifications, will be defined as soil or loose rock that is excavated as well as soil used for backfill, berms and drainage ways.

Materials to be replaced in the designated contaminant area will consist of soil deemed suitable by the Field Supervisor. This soil is to be removed from the stockpile areas as is necessary to achieve a smooth, gentle slope that will promote positive drainage without creating a concern of erosion.

1.3 TYPES OF EARTHWORK

1.3.1 Material Removal

This work will consist of the required excavation of soil from the contaminant area and the shaping and finishing of the areas to the required contours. Areas which require material to be removed are noted on the drawings.

1.3.2 Material Placement

Material placement will consist of providing all labor and equipment for aeration, stockpiling and final placement of all materials in the contaminant area. The work will include the preparation of the surface, spreading and compaction to the lines and grades required to achieve the necessary slopes. Additional material may be needed to reconstruct an existing berm located near the sinkhole as well as the collection ponds.

1.3.3 Channel And Diversion Ditch Construction

Channel and diversion ditch construction consists of all operations necessary for the removal and placement of material in such a manner so as to create stable drainage ways with uniform side and bottom slopes. These drainage ways will be constructed so as to divert surface drainage away from the work areas for the duration of the project.

1.3.4 Stockpiling

All materials excavated from the contaminant area will be stockpiled at the locations shown on the drawings. Stockpiled material will be removed after the areas have been established as being "clean" by the laboratory results and approved by the Field Supervisor.

1.3.5 Hauling

Hauling will be limited to that which is necessary for transport on-site from one work area to another.

1.4 CONDUCT OF WORK

1.4.1 Material Removal

The Contractor's attention is directed to the existence of volatile organics in the vicinity. Although the project incorporates conditions declared to be safe, the Contractor is required to exercise care to avoid intermediate site conditions which may result in risks to workers' health and safety during the construction process. Therefore, Level C personnel protection equipment will be required for work in the trench and aeration areas.

The Contractor must utilize material removal techniques which are generally considered to be conducive to retaining slope stability, including but not limited to, working the slopes from the top to the bottom to preclude undermining. In addition, all vertical faces will be benched when required as per OSHA standards.

The conditions set forth in this subsection will firmly apply until the Field Supervisor has accepted the area from which material has been removed as being satisfactorily completed. The Field Supervisor may not accept any area as being satisfactorily completed if an adjacent work area remains in a condition which may cause damage to the subject area.

1.4.2 Material Placement

All areas where material is to be placed will be constructed in accordance with these specifications and the accompanying design plan, unless otherwise directed by the Field Supervisor.

The Contractor will maintain and protect areas where material is to be placed in a satisfactory condition at all times until completion and acceptance of all work under the contract. If, in the opinion of the Field Supervisor, the equipment causes horizontal shears, rutting, quaking, heaving, cracking or excessive deformation, the Contractor will limit the type, load or travel speed of the equipment in these areas.

The Contractor will remove any material which the Field

Supervisor considers objectionable and will refill the areas as directed, at no additional cost to the owner.

1.4.3 Channel And Diversion Ditch Construction

The construction of drainage channels and diversion ditches will be accomplished as needed after the earthwork has commenced. Construction of such channels will be in accordance with and at the locations shown on the design plan.

1.4.4 Stockpiling

Prior to the stockpiling of aerated material, the area designated to receive the material will be prepared through leveling and berming. The area will be rough graded to achieve a relatively smooth and level surface. Once the soil material has been stockpiled, a plastic cover will be securely placed over it to prevent erosion and avoid contamination of surface runoff.

1.4.5 Hauling

All on-site hauling activities will be conducted by personnel who are trained and certified to handle hazardous waste. All refuse being hauled off-site will be covered in such a manner that loose waste is not allowed to escape. It will be the Contractor's responsibility to ensure that all equipment is considered "clean" at the end of the project.

1.4.6 Stormwater

Water that may accumulate in the open excavations will be treated as necessary in the on-site treatment system. A brief description of the treatment system was provided in Section 3.1.4 of the Final Organic Design Plan. A detailed description is contained in the EPA-approved "Final RD/RA Water Treatment Work Plan" dated January 8, 1993.

1.5 CONSTRUCTION METHODS

1.5.1 Preparation Of Surface To Receive Material

No material will be placed in any area until the area has been stripped as specified and the surface has been approved by the Field Supervisor. The Contractor will keep the area free from water or unacceptable materials after placement operations have started.

1.5.2 Preparation Of Bonding Surface

The surface of the prepared area to receive fill or the rolled surface of any layer of earth fill may, in the opinion of the Field Supervisor, be deemed too dry or smooth to bond properly with the layer of material to be placed thereon. The surface would then be moistened and/or worked with harrow, scarifier or other suitable equipment, in an approved manner, to a sufficient depth to provide a satisfactory bonding surface before the next succeeding layer of material is placed.

When soil material is placed against sloping sides of excavations, slopes of old embankment or natural slopes, the old material will be cut or broken by machine or hand methods, approved by the Field Supervisor, until it shows the characteristic color of moist material. The compaction equipment will then compact both materials, bonding them together.

During construction, the top surface of the fill will be sloped with grades of not less than 2% in order that the fill will drain freely toward the slopes. The final top surface will have a grade of not less than 1%. At no time will the grade exceed 25%.

1.5.3 <u>Lifts</u>

The Contractor will place soil material in the area of aeration in approximately 6- to 9-inch horizontal lifts. Tilling in the aeration area will be conducted as deemed necessary by the Field Supervisor depending on the weather conditions and soil moisture contents. The Contractor will perform the required material removal in the sequence indicated on the attached Organic Contaminant Remediation Site Plan. Placement of the material back into the excavated trenches will also be in approximately horizontal lifts in thicknesses no greater than 2 feet.

1.5.4 <u>Spreading</u>

Material consisting predominantly of on-site soils, when placed in the areas of trench excavation, will be spread as follows:

1. The distribution throughout the area of trench excavation will be such that the fill will be free from voids, pockets and bridging of material. The combined material removal and placement operations will be such that the material, when compacted, will be blended sufficiently to secure the best practicable degree of compaction and stability. Successive loads of material will be dumped so as to produce the best distribution of the material.

2. The thickness of the layers before compaction will not be more than 2 feet. No soil material placed in the fill area by dumping in piles or windrows will be incorporated in a layer without first being moved and spread by blading or similar approved methods.

3. Material in the form of large soil lumps or soil masses will be pulverized by disking, harrowing or by the use of mechanical pulverizers prior to compacting.

4. Rock fragments larger than 1 foot will not be allowed as fill material.

1.5.5 Moisture Control

During compaction operations, the surface of the fill area and the material being placed will be maintained within the moisture content range required to permit proper compaction. An acceptable range for the moisture-density relationship will be established by laboratory analyses of samples collected from the stockpiled soil. In addition, the material being aerated will be sufficiently moistened to avoid dust from blowing off-site. The moisture content will be controlled in the following manner:

1. When material deposited on the fill is too dry, the Contractor will be required to sprinkle each layer and obtain uniform moisture distribution by disking, blading or other approved methods. The amount of water applied will be accurately controlled so that free water will not appear on the surface during or subsequent to compaction operations.

2. Material deposited on the fill that is too wet will be removed or spread and permitted to dry. The drying procedure may be assisted by disking or blading, if necessary, until the moisture content is reduced to the specified limits.

3. When the top surface of a layer becomes too dry or too smooth to permit suitable bonding with the subsequent layer, the Contractor will loosen the material by scarifying or disking. He will then moisten the loosened material to an acceptable moisture content, as determined by the Field Supervisor, and recompact the material.

4. Adjustments to the moisture content will be made on the basis of moisture field tests as construction progresses.

1.5.6 Compaction

The material will be compacted after each 12- to 15-inch layer of material has been placed and spread and contains the required moisture, as described in Section 1.5.5. It will be compacted by passing the compaction equipment over its entire surface a sufficient number of times to obtain an acceptable density (85% standard proctor). Adjustments in the compaction effort will be made on the basis of field density determinations as construction progresses. Field density will be measured using either the sand cone penetration method or nuclear density meter for every 10,000 square feet of each lift.

1.5.7 Decontamination

Decontamination of equipment will begin only after all earthwork has been approved by the Field Supervisor. All equipment that was in direct contact with the contaminated soil will go through a decontamination process as described below.

1. All sampling equipment and utensils will be decontaminated using procedures recommended in the USEPA Region IV Standard Operating Procedures document (February 1991).

2. Larger pieces of equipment which come into contact with contaminants will have the portion impacted by the contact:

   a. Moistened with water-spray.
   b. Scraped of potentially-contaminated soil, which will then be placed on plastic.
   c. Cleaned with a high-pressure steam cleaner.

3. All water used during equipment decontamination will be collected on plastic sheets in the bermed decontamination area and pumped into 55-gallon drums, if necessary. This water will then be sampled and analyzed to establish if maximum contaminant levels for drinking water have been exceeded. If so, the collected water will be treated using the on-site activated carbon unit and discharged into an existing holding pond.

1.5.8 Dewatering

During the remedial action, it is anticipated that, on occasion, storm water will accumulate in open excavations as a result of heavy rainfall. Following such occurrences, ponded water will be pumped from these areas and treated in the same manner as indicated in the Organic Liquid Investigation.

1.6 CONSTRUCTION TOLERANCES

The Contractor will make a reasonable effort to construct the project uniformly. Tolerances which will be allowed, before reworking of the constructed item is required, are as follows:

1. No payment will be made for any earthwork completed outside the limits shown on the drawings or as approved by the Field Supervisor. No materials will be removed or placed outside of these limits without authorization.

2. The design intent is to stabilize the contaminant area and to leave a uniform surface suitable for revegetation, in accordance with the applicable sections of these Technical Specifications. The nature of the project does not lend itself to the establishment of numerical standards for permissible deviation from the templates and lines shown on the drawings. A work area will generally be accepted when, in the Field Supervisor's opinion, the design intent has been achieved.

1.7 MEASUREMENT AND PAYMENT

1.7.1 Measurement

The quantity of material excavated will be measured to the nearest cubic yard. No separate measurement or payment for other types of excavation, such as for channels, subdrains or culverts, will be made.

1.7.2 Payment

Payment for "earthwork" will be made at the contract price. Such payment will constitute full compensation for all labor, materials, equipment and incidentals necessary to complete the work as specified.

2.0 REVEGETATION

2.1 SCOPE

The work will consist of furnishing all labor, equipment and materials for preparing the seedbed, soil amendments and seed and their application, spreading mulch and installing netting. All disturbed areas are to be revegetated in accordance with this specification unless another surface treatment is approved by the Field Supervisor. Revegetation procedures will begin only after the cleanup levels for both organic and inorganic contaminants have been achieved unless instructed to do so by the Field Supervisor. Revegetation will begin as soon as is practicable for each area of the site meeting the cleanup levels, unless they would be adversely affected by continuing remediation in another area.

2.2 MATERIALS

2.2.1 Lime

Agricultural ground limestone or its equivalent will be used as a soil additive. The ground limestone must meet the following requirements: contain sufficient calcium and magnesium carbonate to be equivalent to not less than 80% calcium carbonate and be fine enough so not less than 90% passes through a U.S. Standard No. 50 sieve. Agricultural ground limestone will be purchased from quarries approved by the Kentucky Department of Agriculture.

2.2.2 Fertilizer

The fertilizer will be a commercial fertilizer containing the plant nutrients of nitrogen (N), available phosphoric acid (P_2O_5) and soluble potash (K_2O) at the rates specified in Section 2.3. Bagged fertilizer will display the following information on the bag or on a sticker or tag attached to the bag: net weight, brand or grade, guaranteed analysis, and name and address of the manufacturer.

Bulk fertilizer (dry or liquid) will be accompanied by a statement from the manufacturer which contains the same information required for the bagged fertilizer. Either bagged or bulk (dry or liquid) fertilizer must be manufactured and sold under the jurisdiction of the Division of Regulatory Services of the University of Kentucky Agricultural Experiment Station.

2.2.3 Seed

Seed will be applied to all disturbed areas in accordance with the seed mixture tables herein with no alterations except with the written consent of the Field Supervisor. The seed mixture will be totally free of any quack grass, dodder, Johnson grass, Canadian thistle seed and contain less than 2% weed seed. The number of noxious weed per pound will not exceed a combined total of 30 seed per pound. The seed will also comply with all Kentucky seed laws and regulations (KRS 205.020 to 250.170).

Seed will be furnished fully tagged and labeled in accordance with state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. All seed must be from the latest crop available. No seed will be accepted with a test date of more than nine months prior to the site delivery date. Any seed which has become wet, moldy or otherwise damaged in transit or storage will not be accepted.

All seed will be delivered in separate bags or packages according to species. The tags from each seed bag will be removed at the site by the Field Supervisor. These tags will be required for final payment. Premixed seed will not be accepted.

All legume seed will be treated with inoculant prior to seeding in accordance with Section 2.2.6 of these Technical Specifications. All legume seeds will be applied separately from other grass seed unless a hydraulic seeder is used.

Any and all seeding of lespedeza species (i.e., Kobe, Korean and Sericea) will require unhulled seed during the period of July 1 to December 31. Hulled and scarified seed will be required during the period of January 1 to June 30.

The percent of hard seed will not be considered as part of the germination rate.

See Table 1 for the specified seed mixture.

2.2.4 Mulch

Mulch will consist of hay or straw. The mulch material will be air dry, reasonably light in color, low in weed content and not musty, caked or otherwise of low quality. The use of mulch that contains thistles, Johnson grass or wild onion will not be permitted.

2.2.5 Netting

Plastic netting manufactured from extruded rectangular mesh plastic, a minimum of 45 inches wide with approximately 3/4-inch x 1-inch mesh openings and weighing not less than 2.6 pounds per 1,000 sq. ft. (±1/2 lb.), will be used. Other netting may be used if approved by the Field Supervisor. Staples will be U-shaped and made from steel wire of No. W1-W1.5 or W2 as recommended by the manufacturer for installation conditions. The staples will have a minimum length of 6 inches. Staples will be driven flush with the soil surface.

2.2.6 Inoculants

The inoculant for treating legume seeds will be a pure culture

TABLE 1**

SEED APPLICATION RATES

Seed Mixture	Seeding Rate (lb/ac. PLS*)
Application Period: February 16 to May 15	
Crown Vetch	5
Creeping Red Fescue	30
Potomac or Boone Orchardgrass	10
Korean Lespedeza	10
Birdsfoot Trefoil	7
Medium Red Clover	8
Application Period: May 16 to July 31	
German Foxtail Millet	10
Creeping Red Fescue	20
Potomac or Boone Orchardgrass	15
Korean Lespedeza	10
Birdsfoot Trefoil	7
Crown Vetch	8
Application Period: August 1 to February 15	
Yellow Sweet Clover	10
Creeping Red Fescue	20
Potomac or Boone Orchardgrass	10
Korean Lespedeza	8
Birdsfoot Trefoil	7
Crown Vetch	7
Perennial Rye	8

*PLS - Pure Live Seed is determined by multiplying the percent germination of the seed times the percent purity. Then, dividing this product into the specified rate yields the application rate.

Example: Germination Rate = 70%
Purity = 90%
Rate = 50 lbs. PLS/acre

$$\text{Seed required} = \frac{50\text{ lbs. PLS}}{.90 \times .70} = \frac{50\text{ lbs.}}{.63} = 79\text{ lbs./acre}$$

**Division of Abandoned Mine Lands, KNREPC of nitrogen-fixing bacteria prepared specifically for the species and will not be used later than the date indicated on the container or otherwise specified. A mixing medium, as recommended by the manufacturer, will be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer will be used; when seed is applied by use of a hydraulic seeder, four times the amount of inoculant recommended by the manufacturer will be used. Seed will be sown within 24 hours of treatment and will not remain in a hydraulic seeder longer than 4 hours.

2.3 SEEDBED PREPARATION

Immediately following final grading, the areas to be seeded will be dressed to a reasonably smooth, firm surface as established by the Field Supervisor. Lime will be applied uniformly at the rate of 5 tons per acre, unless otherwise noted. Fertilizer will be sufficiently applied to supply a minimum of 72 pounds of nitrogen (N), 184 pounds of phosphorus (P_2O_5) and 100 pounds of potash (K_2O) per acre. The Contractor will be required to provide a dozer or equivalent to "walk-in" or break up the surface of the soil prior to seeding. This work will be classified as seedbed preparation. Seedbed preparation will be suspended when soil conditions are not suitable. The Field Supervisor will make this determination.

2.4 SEEDING

The specified mixtures of pure live seed (PLS) will be used on all disturbed areas within the project limits designated on the drawings using the seasonal variations shown.

All areas will be seeded immediately following seedbed preparation. In the event the date does not concur with the seeding schedules specified, seeding will be accomplished using any one of the specified rates or an equivalent rate designed to fit the Site and weather conditions, as directed by the Field Supervisor.

All seed will be broadcast evenly over the area immediately following tilling. If a hydroseeder is used, the pH of the slurry will not be allowed to drop below a pH of 5.0. In addition, the Contractor will provide an accurate pH meter to monitor the slurry at all times.

2.5 MULCHING

The mulch rate will be applied uniformly over all seeded areas at the rate of 2 tons per acre.

2.5.1 Netting

Mulch netting will be installed on all slopes exceeding 30%. The netting will be installed with a minimum of 6-inch overlap with the previous row. Staples will be installed at 4-foot maximum spacing on all edges and laps. Interior rows of staples will be at 4-foot maximum spacing with staples spaced in the row at 8-foot maximum spacing. Staples in an interior row will alternate in spacing with staples on an adjacent interior row. All staples will be driven flush with the soil surface. If the Contractor requests, the Field Supervisor may approve the use of netting on areas which are flatter than 30%.

2.6 EQUIVALENCY

These seeding specifications are intended to stabilize the project area through establishment of an adequate vegetative cover and interim protection. The specifications are further intended to enhance wildlife utilization and development in the project area and the surrounding environment. The Contractor may be permitted to incorporate alternate seeding, fertilization and/or protection techniques which produce the intended results. The Contractor is encouraged to consider such applications, however, he is cautioned that, should an alternate technique be utilized, he must assume at least a portion of the responsibility for the deviation from these specifications. In such an event, the Contractor will be required to guarantee a 90% vegetative cover at the end of the second growing season.

Use of alternate techniques or other deviations from the standards and instructions provided herein must be approved in writing by the Field Supervisor prior to implementation. The Field Supervisor will partially base his assessment on the purity of the constituents proposed, as well as the potential for interference of the proposed alternate technique with other elements of the project and the overall design intent. The owner will incur no additional cost beyond the contract bid amount for this item due to the Contractor's use of alternative techniques.

2.7 MEASUREMENT AND PAYMENT

2.7.1 Measurement

"Seed" will be measured by the actual pounds of "pure live seed" (PLS) applied to the Site. "Agricultural Ground Limestone", "Fertilizer" and "Mulch" will be measured by the actual tonnage of each applied to the Site and accepted by the Field Supervisor. "Seedbed Preparation" will be measured by the number of acres disked or tracked and accepted by the Field Supervisor. "Netting" will be measured by the number of square yards in-place and accepted by the Field Supervisor.

2.7.2 Payment

Payment for revegetation will be made at the agreed contract price. Such payment will constitute full compensation for all materials, labor, equipment and incidentals necessary for completion of the work.

3.0 SILT CONTROL

3.1 SCOPE

This work will consist of furnishing all labor, materials, equipment and incidentals necessary for the construction of silt control structures to reduce the amount of sediment delivered to waterways. Silt control structures will be constructed prior to initiation of any earthwork construction, at the locations designated on the plans and/or as directed by the Field Supervisor.

3.2 GENERAL

The exact locations, configurations and dimensions of the various types of silt control structures will be directed by the Field Supervisor at the time of construction. The Contractor will schedule construction activities so that the amount of exposed soil is minimized. This is to be accomplished by disturbing only those areas which are to be worked immediately and by revegetating each area as soon as practical.

3.3 MATERIAL

Either hay or straw bales may be used. All bales are to be firmly bound by twine and are to be installed using wooden stakes.

3.4 INSTALLATION

The general locations and typical configurations of these types of silt control structures are subject to adjustments based on the conditions encountered at the Site. Installation is labor intensive to ensure stable and durable usage; hand labor may be required to provide adequate footing for the bales.

3.5 MAINTENANCE

During the course of the project, silt control structures will be maintained in sound condition and accumulations of silt which may threaten their effectiveness will be removed. Silt removed from silt control structures will be spread in the general vicinity of the individual structures, except when such practices may be detrimental to the environment and/or project.

Upon completion of the project, the Field Supervisor may direct the Contractor to remove, clean or replace silt control structures in accordance with these Technical Specifications.

3.6 MEASUREMENT AND PAYMENT

"Silt Bales" will be measured as to the actual number of bales used, installed and accepted by the Field Supervisor at the work site. Payment will be made at the agreed contract price for the organic removal phase of the project. Such payment will constitute full compensation for all materials, equipment, labor and incidentals.

OVERSIZED

DOCUMENT

MAP